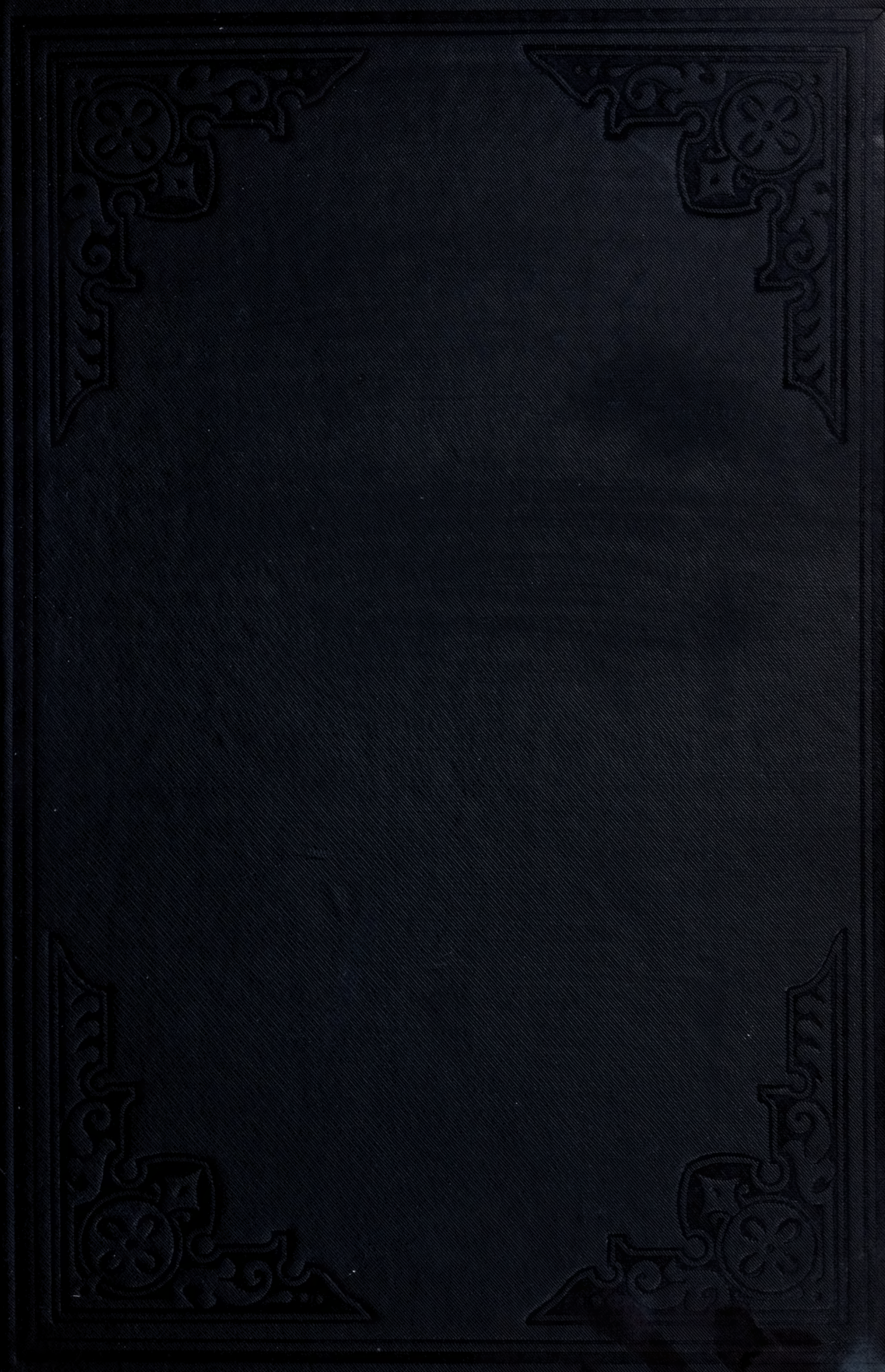

TRANSACTIONS

OF THE

FIFTEENTH ANNUAL MEETING

OF THE

American Academy of Ophthalmology and Oto-Laryngology

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HELD AT
CINCINNATI
Sept. 19, 20, 21, 1910

The Sixteenth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology will be held in Indianapolis, Indiana, September 25, 26, 27, 1911.

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SECTION ON OPHTHALMOLOGY

TABLE OF CONTENTS.

PAGE

1. President's Address.
Wendell Reber 1

2. On Sloughing Corneae in Infants (Anniversary Address).
Sydney Stephenson 9

3. Lantern Demonstration of the Unmodified Smith Operation for Cataract.
Derrick T. Vail 72

4. Smith's Cataract Operation.
D. W. Green 93

5. The Choice of Cataract Operation.
W. A. Fisher 107

6. The Operative Management of Atypical Cataracts—Juvenile Non-Senile.
Percy Fridenberg 111

7. Concerning Congenital Cataract.
John E. Brown 121

8. Progressive Primary (?) Atrophy and Almost Complete Disappearance of Right Iris.
Casey A. Wood 138

9. The Relation of the Trachoma Bodies to Trachoma.
Hanford McKee 147

10. Parinaud's Conjunctivitis.
George F. Keiper 155

11. Standardized Records.
F. Park Lewis 164

12. The Conjunctival Tuberculin Test.
Hermann J. Archard 166

13. A Practical Note on the Use of Bifocal Lenses.
H. B. Young 181

14. Injuries of the Ciliary Body.
Dudley S. Reynolds 182

15. Extractum Corporis Ciliaris in the Treatment of Sympathetic Ophthalmia.
Edward B. Heckel 186

16. Etiology, Pathology and Treatment of Concomitant Convergent Squint.
Linn Emerson 195

17. Some Eye Complications of Accessory Cavity Disease.
Richard A. Johnston 204

18. The Anatomical Relation Between the Sphenoidal Sinus and the Orbit.
Lee M. Francis & James A. Gibson 210

TABLE OF CONTENTS—Continued.

PAGE

19. A Case of Otitic Brain Abscess with Rare Ocular Symptoms.
C. Barck 217

20. Choked Disk.
James Bordley, Jr. 222

DISCUSSIONS.

PAGE
Archard, Herman 179
Barck, C. 221, 230
Bernstein, E. J. 181
Black, W. D. 221
Bradfield, J. A. L. 188
Brown, John E. 132, 163
Byington, John F. 130
Connor, Leartus 201
Cushing, Harvey 233
Dayton, W. L. 192
Emerson, Linn 129, 202
Fisher, W. A. 132
Francis, L. M. 216
Fridenberg, Percy 131
Green, D. W. 134
Heckel, Edward J. 193
Ingersoll, J. M. 214
Jackson, Edward 131, 146, 200

PAGE
Keiper, Geo. 130, 163, 179
Lamb, Robert S. 163, 191, 201
Lewis, F. Park 131, 151
Lichtenberg, J. S. 192, 200
Martin, H. H. 152
Means, C. S. 189
Parker, Walter R. 126, 233
Reber, Wendell 201, 214, 232
Reeve, R. A. 122, 163, 233
Reynolds, Dudley S. 194
Rinehart, H. D. 215
Sherman, H. G. 130, 165
Stephenson, Sidney 163
Stueber, F. G. 129, 188
Vail, Derrick T. 133, 181, 190, 192
Wyler, J. S. 146
Willis, E. A. 201
Young, H. B. 129

SECTION ON OTO-LARYNGOLOGY

PAGE

1. Erysipelas as a Complication of Mastoid Disease.
J. A. Stucky 237

2. Some Lantern Slides Illustrating the Comparative Anatomy of the Nose.
J. M. Ingersoll 247

3. Radiographic Study of Comparative Anatomy of Sinuses and Mastoids in Some of the Lower Animals.
J. C. Beck 260

4. Auto-Toxic Colds.
Sargent F. Snow 270

5. Some of My Mishaps in Seventy-five Cases of Tracheo-Bronchoscopy and Oesophagoscopy.
Secord H. Large 279

6. Symptoms of Temporo-Sphenoidal Abscess.
L. W. Dean 285

7. The Present Status of Labyrinthine Surgery.
S. J. Kopetzky 298

8. Some Remarks on Sinus Thrombosis.
Seymour Oppenheimer 319

9. Manifestations of Thyroid Disease in the Upper Respiratory Tract.
Burt Russel Shurly 340

10. Cylindroma of the Nasal Cavities, with Report of a Case.
Wm. D. Black 348

11. Some Interesting Lesions of the Mouth.
T. E. Carmody 353

12. A Revolving Chair, Resting on Ball-Bearings, for the Making of "Turning Tests."
Samuel Iglauer 365

13. Tonsil Instruments.
Richard J. Tiven 365

14. An Irrigator.
T. E. Carmody 368

15. The Straight Method of Laryngoscopy.
Richard Hall Johnston 369

DISCUSSIONS.

PAGE
Baldwin, Kate W........... 345
Ballenger, W. L..........269, 337
Barnhill, J. F............... 275
Beck, J. C..........242, 257, 269
..............275, 336, 346, 260

PAGE
Kopetzky, S. J.......... 244, 297
.... 338, 368
Kyle, J. J.................... 360
Large, S. H................ 335
Mathers, E. E.............. 345

DISCUSSIONS—Continued.

PAGE
Bernstein, E. J. 359
Black, W. D. 346, 251
Byington, J. F............. 244
Carmody, T. E......276, 359, 361
Dean, L. W. 275, 298
Francis, L. M. 258
Fridenberg, P. 296, 268
Ingersoll, J. M...........259, 246
Iglauer, S. 282, 268
Keiper, Geo. 243
Kirkendall, J. S............ 243

PAGE
Oppenheimer, S. 337, 368
Shurley, B. R. 346
Snow, S. F. 276
Stein, O. J. 242, 283, 269
.... 275, 336, 346. 360
Stucky, J. A.... 245, 283, 295, 336
Vail, D. T. 245, 258
Willis, E. A................ 360
Wood, Casey A............ 258
Young, H. B. 298

OBITUARY NOTICES.

PAGE
Calhoun, Abner W. 373
Heath, Clarence W. 374

PRESIDENT'S ADDRESS

THE ADVANCE IN OPHTHALMIC SCIENCE IN THE PAST TWO DECADES.

WENDELL REBER, M. D.
PHILADELPHIA, PA.

Twenty years ago a prominent medical man, then in the enjoyment of fullness of years and powers and possessions, said gravely to the writer: "Don't go into ophthalmic science. It's interesting enough but since it has been put upon a mathematical basis it is practically a closed science; it has been worked out almost to a finality. Go into some science that is opening up, such as bacteriology or biochemistry. In that direction lie the great things that are yet to be achieved in medicine." That he was sane and gifted with prevision is evidenced by the manner in which the medical world today hangs upon the last word from the biochemists. But the writer has never ceased to be amazed at the elder gentleman's dictum that ophthalmic science was then worked out to a finality; and he is therefore moved to bring before you at this time in more or less rapid review the developments within our own special science that has taken place during this period.

In the domain of anatomy we have learned much concerning the intricate structure of the lids, the capsule of Tenon, the orbital facia and supernumerary muscles, the existence of a dilator muscle in the iris, the presence of pupillary as well as visual fibres in the optic nerve, the proper and exact mapping out of the optic and pupillary tracts back of the chiasm; the anatomic relations of the various nerves governing the motility of the eyes, the presence of lymph channels in the orbit, and the newest ideas concerning the actual anatomy of the angle of the anterior chambers as set forth by Arthur Thomson, Professor of Anatomy in the University of Oxford, England. If these are confirmed and accepted they will go far ot revolutionize our conception of the anatomy of the parts concerned in anterior filtration.

As to comparative anatomy we have gone far. The work of Lindsay Johnson of England, and Casey Wood in our own country alone will serve to explain many formerly obscure conditions because of our understanding of the anatomy of the eyes of the lower animals.

The recent establishment of the *Journal of Comparative Anatomy*, in Germany, only serves to emphasize the importance of this phase of our work. Let us hope also that this development of ophthalmic science may throw some light into the dark subject of congenital anomalies of the fundus oculi concerning which there remains so much speculation. Each individual worker sees so few of such conditions, and the opportunities for microscopic section of such eyes are so rare that every such case should be fully reported and described, along with a color representation of the condition. But among the domestic animals such anomalies occur also and under these circumstances microscopic study would furnish many fruitful data.

In the realm of physiology our science has gone well forward. The exact relation of various cerebral centres to the visual act is now pretty well established. No longer is the occipital lobe the only portion of the cerebral cortex thought of in relation to the eyes. The angular region, perhaps a small portion of the anguloparietal region and a large expanse in the most forward frontal region are now all known to exert their influence over the perfected visual act. The evolution in binocular or stereoscopic vision has also received great attention and there is promise that by study of the highest mammalia we may arrive at more definite ideas concerning the unfolding of this most complex function. Psychology and ophthalmology have drawn much closer together particularly in the study of muscular troubles. Donder's theory for strabismus is no longer supreme; Worth's amplification of Javal's and Priestly Smith's ideas has met with many supporters, while the majority of discriminating ophthalmologists are adhering to a combination working theory to satisfactorily explain all their cases of strabismus.

Among conjunctival diseases that have been generally accepted during this period we may mention vernal conjunctivitis, Parinaud's conjunctivitis, conjunctivitis nodosa and conjunctivitis petrificans. It would be improper to omit at this time mention of the change in our ideas concerning the etiology of most of the forms of conjunctivitis. Today the microscope is frequently invoked to decide between the various forms of conjunctivitis and the day is not far distant when such information will be classified not clinically but etiologically and one will hear more on every side of Koch-Weeks, influenzal, diplobacillary, pneumococcus, diphtheritic, and Neisser's conjunctivitis, than of acute, subacute, chronic, catarrhal, purulent, croupous or membranous conjunctivitis. The same is true of corneal diseases. It is only a question of time until the classification of its diseases is put on an etiologic rather than a clinical basis. The interdependence of much obscure superficial corneal disease and nasal lesions is also largely a development of the past two decades. Keratitis superficialis punctata, keratitis disciformis and keratitis marginalis profunda are now accepted clinical pictures.

The only new features concerning the iris is the disposition to return to the dictum of Fuchs that there is practically no simple iritis but always a more or less complete uveitis. This conception satisfies all ideas and theories concerning disease of the uveal coat and it is to be hoped that writers, teachers and clinicians will observe this change in nomenclature. One hates to open the question of sympathetic uveitis or ophthalmia but no one need hesitate to endorse the claims of Gifford for the value of the fullest possible dosage of sodium salicylate in all such conditions. It is the one ray of hope held out to us in the twenty years agone in the management of these appalling cases;—that is to say after they have developed. But in their prevention, the last decade has witnessed an out and out triumph in the exact localization of all penetrating foreign bodies by means of the *X*-Ray. The names of Sweet in this country and Mackenzie Davidson in England will be forever associated with this method that has not only already saved hundreds of injured eyeballs but done away with the necessity of their removal or the subsequent ruining of the fellow eye by the sympathetic process.

In spite of all the work of the experimentalists and the biochemists we regret to be obliged to state that the question of the medicinal treatment of incipient cataract is as unsatisfacory as it was twenty years ago. We can speak more hopefully however, concerning the operative management of incipient cataract. No discerning ophthalmic surgeon would today hesitate to extract an unripe cataract in a person over sixty years of age if their vocation made it necessary and their health permitted. It is altogether likely that this will also prove the field of greatest usefulness of the now well known Smith operation of removal of the lens within its capsule. This seems to be the prevailing opinion among such American ophthalmic surgeons as have tried this method.

When we come to consider the orbit there is much to congratulate ourselves about for our own knowledge touching the inflammatory conditions of the orbit has grown with great rapidity. The work of Onodi, Cryer, Logan Turner, St. Clair Thomson, Holmes, Howell Evans, Loeb, Posey, de Schweintz, and others reveal how we formerly went wrong in ascribing most orbital inflammations to endogenous causes when in fact they were due to some manner of nasal or accessory sinus disease.

Concerning choroiditis there is precious little that is new other than it is today often accepted as a posterior uveitis indicating almost invariable disease further forward. Continued low grade choroiditis or choroidal congestion as the condition antecedent to the formation of incipient cataract is today one of the best accepted clinical facts. It is also worthy of note that each year sees more cases of tubercular choroiditis brought to report, thanks to the pioneer labors of Sydney Stephenson and George Carpenter.

As to retinitis there is not much to chronicle unless it be the seeming increasing frequency of retinitis circinata and the postulate of W. T. Shoemaker that retinitis pigmentosa is a congenital disease, an hypothesis that has much to commend it.

The optic nerve, however, has been a field of much progress during this period. Retrobulbar neuritis has become a well recognized clinical entity, unilateral optic neuritis is known in many instances to be a focal manifestation and the relation of optic neuritis to brain tumor brings out one of the most important relations of the ophthalmic to the general surgeon. Moreover, the decompression operation for the restoration of sight or its preserveration is distinctly an achievement of the past decade.

Glaucoma has been a continuous battle ground. On two things there seems agreement—first as to the part played both by auto-intoxication and the arterio-sclerotic process in the production either of non-inflammatory or inflammatory glaucoma. But when the decision is made as to what operation shall be performed, one is bewildered by the array of operative procedures offered. All manner of filtration operations are now in vogue and one may choose Herbert's or Lagrange's filtration method, Heine's cyclodialysis, or the trephine operation. Thompson Henderson has driven home one valuable point, namely, that unless an iris is badly altered anatomically, the cut edges after iridectomy do not heal and filtration thus goes on continuously. It is chiefly about non-inflammatory glaucoma that the most diversity of opinion has sprung up. Formerly all these cases were operated on indiscriminately but within the past decade the sentiment has grown against operation, the feeling being that miotics (properly used) along with continued good elimination afford the patient the best chance. Operation may be reserved for the final coup.

Laboratory diagnosis has become each year more and more essential to good ophthalmic work. Many cases of conjunctivitis and keratitis are not possible of exact classification without the microscope. Resort is had in some one of the tubercular tests almost daily in all obscure ocular inflammations. Search for the malarial parasite oftimes reveals a hidden cause and the reactions of Wasserman and Noguchi promise to clear up many a doubtful case beyond all shadow of a doubt. Indeed this is probably the greatest aid ophthalmic science has received in the past two decades.

The relation between diseases of the eye and those of the nose have at last been clearly defined, also between ocular and dental diseases. As to the intimate relations between diseases of the eye and those of the nervous system, a most voluminous literature has accummulated in the past five years. Three extensive treatises on this relation have been issued, one in Germany (four volumes), one in France, and one in this country. The part played by the eye in the arterio-sclerotic process is now more keenly appreciated than ever and its relation to altered blood pressure fixed. Indeed the time has come, fortunately, when the ophthalmic surgeon must be a thoroughly trained general medical man with a special skill in the treatment of diseases of the eye.

In his sociologic relations too, the ophthalmologist is taking his proper place. For twenty years and more, the painstaking examinations of school children's eyes have been going on all over the United States and the indications are that by the time of the next census enough data will be at hand on which to base fairly firm conclusions. In the public services the activity has not been so great, altho in recent years the army, navy and marine corps are awakening to the necessity of the best possible vision in these callings. In the mercantile marine much crudity has existed in the tests made, but thanks to the activity of Posey and others, there seems now an indication that this too will be remedied. Eventually this same surveillance must needs be extended to all public service corporations in the municipalities throughout the country.

In one thing American Ophthalmology has taken the lead in the past twenty years, and that is in the practical application of the science of refraction—of the truth as it is in Donder's. This is the peculiar glory of the American ophthalmic profession. They have proven the wisdom of search for every bit of astigmatism in myopia and its full correction as a means of preventing its further advance. They have further proven the need of search for hypermetropia and its allied astigmatism in every one who has need to use his eyes to any extent. There are those who claim that in this particular matter we are tipping the balance to the other side; but better the excess of zeal in this direction than the defect of carelessness. On this one accomplishment alone the ophthalmic profession in America might well rest, but much more is their due measure of credit.

In searching out this phase of the matter it was decided to find out approximately what part this Academy has taken in assisting in the advance of opthalmology during the past two decades. It is interesting to learn that of the 600 and more members of the Academy, thirty-five are the authors of various text books on the eye, ear, nose and throat; thirty more have taken part in the preparation of various systems on these kindred diseases; sixty are engaged in the teaching of ophthalmic or rhinologic science and 225 contribute from time to time to magazines devoted to these allied subjects. This is a record of which we may well be proud. The question now arises as to what shall be the future of the Academy? This depends on several factors:

1. It must continue to maintain a membership that shall be representative of the best the profession affords.

2. This membership must be drawn from the teachers, writers, and clinical observers on the one hand; and from that large class of earnest workers in the lesser cities and towns who do not enjoy such affiliations on the other hand. If this latter class will come to the meetings and discuss moot questions from the standpoint of their individual experience the Academy and ophthalmic science will profit much by their co-operation.

3. The membership must be representative of every portion of the United States and not of any section thereof.

4. The Academy must eventually so amend its Constitution as to admit not only to membership but to office holding any Canadian who may be a member of the British Medical Association, and any Latin American (Central and South American) who can be shown to be in good standing in his respective country.

5. The Academy would do well to so amend its Constitution and By-Laws as to admit to what might be constituted an Associate Membership our European or Asiatic ophthalmic surgeon who could be shown to be in good standing in his respective country. This would not necessarily carry with it the right to hold office.

6. The Academy must at all times stand ready to foster and forward any and all projects and movements looking to the advancement of ophthalmologists and oto-laryngologists the country over.

7. The Academy should live up more fully to the provisions of Article II of its Constitution and By-Laws which provides that, "The object of the Academy shall be to encourage the study and practice of medicine and surgery in their relations to the eye, ear, nose and throat." To this end, it is urged upon the membership that some manner of fund be established from which annually, or bienially or trienially either an award be made to any member of the Academy who may have made some signal contribution to ophthalmology or otolaryngology, or that a traveling scholarship of $300 to $500 be instituted to be awarded to any member of the Academy who may make a contribution to our allied sciences of sufficient merit to justify such award. This will fulfill the object of Article II which plainly

defines the function of the Academy, namely, to encourage its younger members to original research with the idea of rewarding such research in some suitable manner. This is the true function of such an Academy and this must be the response to the old medical friend of twenty years ago.

In another direction there is the hope held out to us by the action of the late International Opthalmological Congress at Naples and the British Optical Society that we may eventually arrive at some manner of standardization all along the scientific line, including usual standards, notations of lenses and prisms, their axes and their sizes. Colored glasses according to their obsorphac powers, color tests, etc. In this matter the British Optical Society is entitled to the thanks of the ophthalmic surgeon the world over for the public spirit shown and the high standard set in their work.

As to therapeutics the advance has been remarkable. Dionin is a faithful servant, the organic silvers (chiefly among which is an equal notwithstanding the protests of the bacteriologists and laboratory experts) are firm friends and chemistry has outdone itself to replace cocain; and while that has not been accomplished, we should never cease to be grateful for cocain, novocain, alypin and stovain.

Organatheropy has contributed its share to our glory as witnessed by the value in certain forms of interstitial keratitis and strumous ocular conditions in young girls.

Radiotherapy naturally has been brought to our aid and the value of law vacuum *X*-ray tubes and of radium itself in the assimulation and cure of all manner of external diseases of the eye needs but to be mentioned to be accepted.

No review of the subject of therapeutics would be complete that did not include that greatest of all advances, serotherapy. Whether this shall be specific as claimed by Rösner and Axenfeld or paraspecific as advocated first by Darier and later by Deutschman each worker must decide for himself. Our own feeling is that until we are in the possession of more clearly defined facts the chances for the patient's recovery from his ophthalmic disease are greater under paraspecific than under specific-serotherapy. Let us first cure the patient and then, as quickly as may be, learn just how it is brought about.

Lastly as to therapeutics we cannot forbear mention of Ehrlich's latest preparation, "606," concerning which the most startling claims are now being made as to results in the treatment of syphilis. If these claims are substantiated the duration of the treatment of many specific eye diseases will surely be much shortened.

Tonometry is a relatively new field but the tonometer as an instrument has come to stay. Schiotz instrument, or better yet Gradle's modification of it, must become a daily instrument in the hands of the ophthalmic surgeon and the wealth of knowledge to be gained by its use is beyond present computation.

We have seen ophthalmic science advance every year of the way, not by leaps and starts, but by that gradual accretion of knowledge that is the basis of all final truth. It is still a young science, full of hope, faith and power, and rich with opportunities, possibilities and privileges.

In conclusion let us be thorough in all we do. Let us be strong and the exercise of our strength today will better equip us for the morrow. Today is our day—your day and mine—the one day we have—the day in which to play our part. What our part may signify in the great whole we may not understand—but we are here to play it—and now is the time.

ON SLOUGHING CORNEÆ IN INFANTS:

AN ACCOUNT BASED UPON THE RECORDS OF THIRTY-ONE CASES.*

SYDNEY STEPHENSON, D. O. (Oxon.).

LONDON, ENGLAND.

That the cornea may become gangrenous in babies suffering from inanition is a fact that must have struck attentive observers since the earliest dawn of scientific medicine.

The condition is tolerably common in several parts of the world. Thus, in Berlin, A. von Graefe[1] spoke of seeing the disease almost every session and sometimes of meeting with three or four such cases in the course of a single month. Hirschberg,[2] again, declared that of the 7,000 new cases received at the Berlin *Klinik* every year, eight or nine were instances of keratomalacia. It is frequent, according to Thalberg,[3] in Russia, especially towards the termination of the great Lenten fast (end of March and beginning of April) and after the fortnight's fast in August. Nine of the thirteen cases reported by Thalberg were in children under 3 years of age, and of them 77.77 per cent. were in sucklings. It prevails also among the half-starved negro children in South America, where it goes under the name "Ophthalmia Braziliana," bestowed upon it by Gama Lobo.[4] That author reported four fatal cases in children, in whom there likewise existed pronounced pulmonary and gastro-hepatic disturbances. Gama Lobo laid particular stress upon the lethargy exhibited by the patients, who would remain for hours together in any given position. Ullersperger[5], who wrote in the same year as Gama Lobo, described four fatal cases in children of from eighteen months to five or six years of age. de Gouvêa[6], writing seventeen years later, confirmed and extended Gama Lobo's observations in Rio de Janeiro. He pointed out that night-blindness invariably preceded the other ocular symptoms, and he added some new signs of the Brazilian ophthalmia—as, for example, alopecia, pica, ulcerations over bony prominences, and yellowish *plaques* upon the skin, particularly of the face. The cause of the disease, in his opinion, was the almost exclusively farinaceous

*Anniversary lecture of the American Academy of Ophthalmology and Oto-Laryngology delivered at Cincinnati, Ohio, U. S. A., on Sept. 19, 1910.

nature of the food given to the slaves on most of the Brazilian haciendas. "This, combined with severe work and lack of sleep," he remarked, "makes of the slaves veritable gold-producing machines."

Colonel H. Herbert[7] found epithelial xerosis to be so common among the poorer classes in Bombay, India, that he was able to collect one hundred consecutive cases in four months, June to September, 1896. In infants, as he pointed out, the cornea was liable to rapid suppurative destruction. According to M. Mori,[8] in Japan this peculiar disease of children is well-known. It appears epidemically in that country during the months July to September, when diarrhoea is rife, and is known in the vernacular as "Hikan." The chief symptoms are diarrhoea, voracity, distension of the abdomen, wasting, dryness of the skin, night-blindness and xerosis of the conjunctiva. In severe instances the hair loses its sheen and becomes dry; the cornea gets opaque and there is hypopyon and prolapse of the iris; and the case ends in complete disorganization of the eyeball. Colonel M. T. Yarr[9] tells us that keratomalacia is not uncommon in the tropics, especially in the native quarter of great towns, such as Calcutta, Bombay, and Hong Kong. The patients, who are mainly children, emaciate rapidly, suffer from diarrhoea, and frequently die.

A similar condition is found, although it is not common, in England, where it affects babies whose nutrition is at a dangerously low ebb. The disease was described in 1827 by Joseph Brown,[10] of Sunderland, in a brief communication which bore the significant title of "*A case of ulcerated Cornea from Inanition.*" He met with a case in a baby of six months, who had never had the breast-milk, and who was so much emaciated that the movements of the intestines were visible through the parieties of the abdomen. *Mackenzie[11] refers to the conclusion as one that he had repeatedly seen in infants emaciated from various causes, as chronic diarrhoea, cough following measles, hydrocephalus, and syphilis. Sir William Bowman[12] met with a case in a marasmic infant of thirteen months in whom both corneæ sloughed, and the child died five days after she was first seen. W. T. Holmes Spicer[13] published an account of three cases in the year 1893. A year later, Tatham Thompson[14] narrated a fatal case in a baby of two months affected with acute jaundice, not of congenital origin. Two instances of keratomalacia, both apparently due to disseminated tuberculosis, were published by myself[15]—one in 1902 and the other in

*The communications of Brown and Mackenzie effectually disprove the claim made by Adolf Knaebel (Ueber Keratomalacia infantum, Tübingen, 1901), namely, that the first cases of keratomalacia were published in the year 1846 by J. N. Fischer (Lehrbuch der gesammten Entzündungen und organischen Krankheiten des menschlichen Auges. 1846, S. 275). For that matter, Rau (v. Ammon's Monatsschrift, 1841), published two cases in children, aged 5 and 10 years respectively, five years before Fischer wrote.

1905. Arthur W. Ormond[16] reported a bilateral case in a wasted infant of ten months, affected also with xerotic patches on the conjunctiva. The patient was the youngest of fourteen children. Neither syphilis nor tubercle appeared to be present in Ormond's patient. Lastly, in 1907, I[17] published an account of four cases of infantile gangrene of the cornea, in scrapings from which the treponema pallidum was found.

As may be gathered from the scanty references given above, keratomalacia is far from common in England. But that is an entirely different thing from asserting its absence, as a recent writer, N. Bishop Harman,[18] has done. In the work referred to Harman makes the singular statement that severe forms of xerosis conjunctivæ associated with keratomalacia apparently do not occur in England, except following the ophthalmia of newly-born children. As a matter of fact, under the conditions named by Harman the disease is rare.

To judge from the paucity of published cases (not always a safe thing to do), keratomalacia must be uncommon in the United States. So far as I know, the disease has been described from first-hand knowledge only by William S. Little[19] (1882), J. E. Weeks[20 and 21] (1887 and 1901), Thomas C. Evans[22] (1898), J. M. Ray[23] (1898), and Charles W. Kollock[24, 25 and 26] (1890, 1892, and 1894).

Isolated examples were described by the first four writers, but Kollock's several communications were of more interest, since they showed that keratomalacia, associated with xerosis and pigmentation of the conjunctiva, was common among the young negro children of Charleston, the largest city of South Carolina, where more than one-half of the inhabitants are coloured. The disease was never seen among the whites. Kollock surmised that the food of the negroes, whose *menu*, according to the description he gave, consisted of "hominy (grits), rice, fish, and bad hog meat," had something to do with the condition. On the other hand, the whites were immune, he thought, because they did not eat so much fish, and "the quality of hog meat was better than that used by the negro, who will frequently buy strong smelling meat in preference to that which has no odour." In Kollock's experience, when the cornea broke down and suppurated, treatment availed little, and the patient soon died.

From what has been said it may be concluded, then, that a destructive form of keratitis, often associated with xerosis of the conjunctiva, may be met with in young children of low vitality, not only in Germany, Russia, Brazil, the East Indias, China, and Japan, but also in England and in some parts of America.

With two exceptions, the cases which form the basis of the present communication, thirty-one in number, were encountered at two London hospitals for children, *viz.*, the Evelina and the Queen's. The former furnished six cases and the latter twenty-three cases of keratomalacia. The relative size of the hospitals has doubtless something to do with the different number of cases seen at the two places. There is, however, another factor.—The difference in the figures is correlated with a difference in the class of child attending the two institutions. Thus, the Evalina draws its clients mainly from the rural, semi-rural, and surburban districts south of the river Thames, whereas the Queen's derives 85 per cent. of its patients from densely-populated and poverty-stricken districts in the east-end of London, where indigence, dirt, ignorance, vice, and alien immigration jostle one another at every corner.

As babies suffering from keratomalacia are always ill (often dangerously so), it can be readily understood that they are usually kept at home, or if taken to a hospital, an ophthalmic hospital is not the most likely place where advice would be sought. Hence, it is at a large children's hospital in the poorest part of a great city like London that such cases are likely to be met with, if anywhere.

Among 7,000 patients Hirschberg saw 8 or 9 cases of the disease (1 in 875 or 1 in 777); among 28,000 patients Leber met with 4 cases of the disease (1 in 7000); among 30,000 patients Braunschweig[27] saw 16 cases (1 in 1875; among 34,000 patients Kuthe[28] met with 26 (1 in 1307); and, finally, among 16,600 patients Peltesohn[29] found 3 cases (1 in 5533).

From the figures at my disposal, I estimate that keratomalacia is encountered in one per thousand of the eye cases attending a children's hospital in the poorer part of London.

Keratomalacia, in my experience, is a disease of children whose ages range from one month to twenty months. It is as rare above as it is below those limits. The oldest patient seen by A. von Arlt,[29] who described the disease as long ago as 1850, was fourteen months of age. It is of some importance to note that during the first few weeks of life—that is to say, when ophthalmia neonatorum is rife—keratomalacia is uncommon. At the same time case No. 11 in my present series occurred in a premature baby admitted on the seventh day of extra-uterine life. The baby, although kept in an incubator, succumbed, after an illness lasting twenty-seven days, from a cause that was never satisfactorily explained, despite a *post-mortem* examination. The baby may possibly have died from a general streptococcal infection, such as is believed by Kassowitz and Hochsinger[30a] to occur in syphilitic infants. The ages of my other patients have ranged from one month to twenty months, seventeen of the total number (*i. e.*, about one-half) having occurred between the eighth and twelfth months of life. The average was 4.54 months. In face of these facts it becomes a little difficult to understand on what grounds Valude[31] makes the statement that the affection ordinarily begins in the first few weeks of life and is not met with after ten months. It may be noted in passing that in Knaebel's[32] series of eighteen cases of keratomalacia the youngest patient was aged three weeks and the oldest six months. The average was 11.16 weeks.

Personally, I have never seen an instance of keratomalacia except in the children of the poor.

As regards sex, Knaebel's figures[32] seemed to show that keratomalacia was much commoner in males than in females. Of his eighteen cases, 83 per cent. (15) were in males and 17 per cent. (3) in females. Thalberg's figures, again, give males 6 (66 per cent.) and females 3 (33 per cent.). On the other hand, Braunschweig's figures[27] dealing with 16 cases, gave males 5 (31.65 per cent.) and females 11 (68.75 per cent.) My own cases indicate no such disproportion between the sexes, which is probably merely fortuitous. Of my thirty-one cases, 13 (41 per cent.) were in males, 17 (54 per cent.) in females, and in one (3 per cent.) the sex was not noted.

von Graefe, as well known, attributed keratomalacia in infants to encephalitis, and Hirschberg adopted a similar view. The changes supposed to be characteristic of encephalitis were found by Professor Klebs in two of von Graefe's patients, aged three and four months respectively. The three cases described by Hirschberg showed, after death, similar changes. Bezold[33] found a degeneration of the glial cells of the brain in an infant, aged one month which developed keratomalacia after measles. In reporting a fatal case in a female infant of ten weeks suffering from "spasms" and diarrhoea, William S. Little[19] spoke of keratomalacia as "symptomatic of a brain lesion, with a neuro-paralytic condition of the fifth nerve distributed to the cornea." He describes the condition as preceded by convulsions or loss of consciousness, and speaks of all cases being associated with a brain lesion of severe character, central in position and rapid in progress. In 1883, Jacqusiel[34] presented sections from the brain of such a case with the idea of supporting v. Braefe's theory of causation; but more than one member of the Berlin Medical Society, after examining the specimens, expressed his doubts as to their pathological nature.

It may be asked why v. Graefe's view, apparently so well grounded on the work of competent pathologists, has found but little support of late years. The reason is simple, namely, that the diffuse infantile encephalitis of Virchow is nowadays regarded as non-existent. Certainly, with rare exceptions, as in Weeks' case and in one of my own, the clinical symptoms do not point in the direction of a cerebral affection, a fact insisted upon by v. Graefe and by Hirschberg themselves. The only kinds of infantile encephalitis recognised at the present time are such as may occur locally in association with meningitis, or with syphilitic arteritis or with thrombosis secondary to an infective disease, such as measles.

Jastrowitz[35] examined the brains of 65 infants who had died from various causes, and found the changes supposed to point to encephalitis present in all save one. Indeed, the existence of an encephalitis recognisable only with the microscope, such as that thought to exist in v. Graefe's and the other cases, must in the light of modern pathological knowledge be regarded as something more than merely doubtful. In brief, we are compelled from the evidence before us to conclude with Max Knies[36] that the granulo-fatty corpuscles, once looked upon as characteristic pathologically of encephalitis, are now known to occur in the brain of all little children.

Writing in the year 1877 Förster[37] laid considerable stress upon diarrhoea as a cause of keratomalacia in infants during the first six months of life.

W. T. Holmes Spicer,[13] who reported three cases of keratomalacia in the year 1893, concluded that the malady affected "starving or hand-reared infants brought up on starch foods without milk, and with absence of nitrogenous elements of fat." This statement seems to me to amount to little more than a very fair description of the food usually given by ignorant mothers to very poor babies in London. Whether it is enough to account for sloughing of the cornea, I will not undertake to say. But of one thing I feel tolerably certain, namely, that if it be, then keratomalacia should be much commoner in London than appears to be the case.

J. Tatham Thompson[14] considered acute jaundice to be one of the causes of keratomalacia.

In 1883, Leber[38] described a case that seemed likely to throw a new light upon the ætiology of keratomalacia.—A baby, aged four months, suffering from that ailment, died from broncho-pneumonia. After death, cocci and bacilli, similar to those found in the eye during life, were discovered in the calices of the kidneys, along with a desquamating epithelial affection analogous to xerosis of the conjunctiva. In this connection, however, the fact may be mentioned that in ordinary idiopathic marasmus the kidneys, according to Koplik,[39] may be the seat of parenchymatous degeneration.

In the following year (1884) Schulz[40] published a case confirmatory of Leber's observations. Schulz found cocci and bacilli, the exact nature of which he did not determine, in the conjunctiva, lungs, and kidneys of a baby of five months, which died from keratomalacia and broncho-pneumonia, after an illness which lasted for about twenty days. The value of the observation, however, is somewhat lessened by the fact that the autopsy was not made until fifty-two hours after death.

In 1888, Leber and Wagenmann[41] described a case which suggested that keratomalacia may be the outward and visible sign of a generalised bacterial invasion.—A male baby, aged ten days, manifested necrosis of the ocular conjunctiva around the cornea of the right eye, which itself remained almost free from opacity. The left eye showed no changes. Syphilis was not present. The child died a few hours after it was first seen. The autopsy, undertaken by Professor Orth, eleven hours after death, failed to reveal any cause adequate for death, and, in particular, there was no evidence of encephalitis. Bacteriological investigation, however, brought to light the fact that a multiple streptococcal invasion existed. Streptococcal chains were found in the vessels of the tissues of the eye, as well as in the other organs examined, *viz.*, the kidneys, the suprarenal bodies, and the skin. By Leber and Wagenmann this bacterial invasion was believed to be responsible both for the ocular affection and for the lethal issue of the case. It is, nevertheless, to be noted that the baby had an affection of one external ear, presenting a close resemblance to gangrenous dermatitis, a disease known to occur in marasmus, and to be usually associated with the streptococcus pyogenes (L. E. Holt). Is it not possible that the generalised streptococcal invasion was connected more closely with the ear than with the eye trouble?

Bahr and Garnier[42] made an autopsy upon a case of ulceration of the cornea in an infant of fourteen months, and found the immediate cause of death to be purulent meningitis and bronchitis. Masses of streptococci were present in the vascular tissues of the eyeball, and the same micro-organism was cultivated from the sanious pus of the subdural space. The authors explained their case by supposing that the streptococci, after perforating the cornea, had gained access to the circulation, had by that means infected various parts of the body, and by their localisation in the brain had caused the death of the patient.

An important case by J. E. Weeks,[21] of New York, bears upon the possibility of endogenous infection as the cause of keratomalacia.—An emaciated and bottle-fed baby, *ætat* eight months, suffered from xerosis of the conjunctiva, together with ulceration of the corneæ. Death from exhaustion after a stay of eleven days in the New York Eye and Ear Infirmary. The autopsy showed a fatty liver and enlarged spleen and kidneys. The pelvis of the right kidney was filled with flocculent pus, while its lining mucous membrane was coated with a frothy, whitish exudate, resembling to some degree the secretion on the conjunctiva observed during life. Bacteriological examination showed that the xerosis bacillus was present in conjunctiva, pelvis of the kidney, liver, spleen, and pancreas.

Although it appears to be supported by some of the cases mentioned above, yet the theory of endogenous infection may, in my opinion, be put to one side without hesitation. The experiences of Baumgarten and of Braunschweig[27] prove that, as a rule, micro-organisms can be grown neither from the blood during life, nor from the viscera after death, of children affected with keratomalacia. All available evidence, indeed, goes to show that the determining cause of the corneal ulceration is to be found in exogenous infection with this or that pyogenic micro-organism, while its predisposing cause is the lowered vitality of the patient. The predisposing cause would probably be inadequate without the exciting cause, and *vice versâ.*

Keratomalacia, then, in my view, is not to be regarded as the mere local manifestation of a generalised infection, as suggested by the cases of Leber, Schutz, Weeks, and some others.

It is significant that keratomalacia hardly ever occurs in breast-fed babies, unless, as in Russia, the mother's health has become impaired by long fasting, a thing scarcely likely to happen either in America or England. This point is well brought out by Knaebel's figures[32], according to which only three of eighteen children with keratomalacia had been nursed by their mothers, and the rest, fifteen in number, had been reared on various kinds of artificial food. My own figures tell the same tale and point the same moral.—Of my thirty-one cases, two, or 6.46 per cent., were entirely breast-fed; twelve, or 38.71 per cent., were fed exclusively upon artificial food; and seventeen, or 54.83 per cent., were reared partly upon breast milk and partly upon artificial food.

Two important points brought into relief by Knaebel[32] are that—(1) keratomalacia is disproportionately frequent in twin children, and (2) illegitimate are more apt to be affected than legitimate offspring.*

Without exception, the victims of keratomalacia are marasmic—"little wasters," in the pitifully expressive slang of a children's hospital.

The marasmus may be either symptomatic or idiopathic. The causes of the former include tuberculosis, syphilis, and imperfect dieting, with its sequels in the shape of chronic diarrhoea and vomiting, the familiar "D. and V." of a children's hospital. It is, however, to the idiopathic group that the name "marasmus" or "athrepsia" may more properly be applied. In such cases, as well known, neither examination during life nor dissection after death enables us to ascertain the cause of the malassimilation, which may possibly be due, as some have supposed, to microscopical changes in the glands and other appendages of the alimentary tract. It is, as L. E. Holt has well said, "a vice of nutrition only."

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*Of Knaebel's eighteen cases of keratomalacia five were in twins; fifteen were legitimate and three were illegitimate children.

In London keratomalacia has a distinct seasonal incidence, due to the fact that "D. and V." ("xymotic diarrhoea" in more technical terms) is more or less epidemic in that city during the months of June, July, and the early part of August. Thus, of thirty cases of keratomalacia, about three-quarters (73.33 per cent.) appeared in the six warm months, May to October, and only about one-quarter (26.66 per cent.) during the six colder months, November to April. No cases were met with in January and April. For some unexplained reason, however, March proved an exception to the rule, since no fewer than four cases of keratomalacia came under notice during that month.

The connection between keratomalacia, on the one hand, and the disease variously known as "epidemic enteritis," "zymotic enteritis," "ileo-colitis," or "epidemic diarrhoea," on the other, may be brought out in another way, namely, by contrasting graphically the seasonal curve of the two ailments. This has been done in the accompanying diagrams, an inspection of which shows that June, July, August, and September represent the greatest mortality from epidemic diarrhoea and the greatest incidence of keratomalacia diarrhoea, like keratomalacia, falls during September and October, and with the exception noted above, scarcely exists during the remaining months of the year.

If we distribute thirty of the cases of keratomalacia amongst the four quarters of the calendar year, we shall find that the malady was most prevalent in the third quarter, next prevalent in the first quarter, and was equally prevalent in the second and fourth quarters. If this be compared with the prevalance of zymotic diarrhoea distributed in the same way, the close correspondence in the highest seasonal variation of the two maladies will be at once apparent. It might be closer still were not the figures dealing with keratomalacia necessarily so restricted.

Quarter	Zymotic diarrhoea[43] (15,478)	Keratomalacia (30).
First	8.7	20.00
Second	16.8	16.67
Third	60.7	46.66
Fourth	13.8	16.67

The syphilitic origin of keratomalacia has been insisted on by several writers, amongst whom may be mentioned Horner (1882), Biber

(1890), Zirm (1895), Peltesohn (1898), Evans (1898), Krausse (1899), Valude (1905), and Terrien (1905). Horner[44] met with cases of keratomalacia which recovered, and which later developed true interstitial keratitis. He also saw in the same family an infant suffering from keratomalacia succumb to athrepsia, while a brother presented the classical signs of Hutchinson's interstitial keratitis. Terrien[45 and 46], indeed, does not hesitate to claim that hereditary syphilis constitutes the chief factor in the production of keratomalacia, although he adduces no formal proof of this somewhat sweeping statement. Wicherkiewicz[47] goes even further, and, if I understand him aright, denies the ability of any factor, other than hereditary syphilis, to cause the disease.

The discovery by myself[17] of the spirochaeta pallida in scrapings from the cornea constitutes the experimental proof (if such were needed) of the reality of syphilis as a factor in the causation in certain cases of keratomalacia.

A glance at the curve representing the age incidence of my thirty cases of keratomalacia shows a rise extending from the first to the third month, followed by a fall, after which the incidence of the disease becomes greater until it reaches its maximum in the eighth month. The inital rise appears to be accounted for by the fact that the manifestations of congenital syphilis, as shown in the well-known monograph by the late George Carpenter[48], of London, reach their highest point in the second month of life, and then slowly decline until after the ninth month, when they may be said to be practically non-existent. It is interesting to observe that even in a small series of cases such as mine, the influence of syphilis is able to imprint itself in so definite a manner upon the age incidence of keratomalacia.

Finally, it may be added, that of my 31 cases of keratomalacia, syphilis was diagnosed clinically in seven cases, or 22.58 per cent.

Tuberculosis existed in six (19.36 per cent.) of my thirty-one cases of keratomalacia, the diagnosis being made during life in three and after death in three of the children. It is to be noted that of the twelve fatal cases tubercle was present in 25 per cent. The disease was of the generalised type, as usual in children of so tender an age, with pulmonary or meningeal manifestations. The figures are small, but so far as they go, they indicate that tuberculosis is an important cause of keratomalacia in infants. I will not now stay to enquire whether the tuberculosis was primary, or merely grafted, so to speak, on a pre-existing malady, nutritional or otherwise. It is of more importance to remember that at such an early age there are many points of resemblance between marasmus, on the one hand, and tuberculosis, on the other. Progressive wasting, pallor, and loss of strength are features common to both affections. Many a case assumed to be one of marasmus has been found upon the dissecting-room table to be one of tuberculosis.

Much as in Russia, where, as already said, keratomalacia is commonest towards the end of the great religious fasts, so in London its greatest prevalence coincides with, or closely follows, the season when zymotic diarrhoea is most frequent. A similar sort of thing, according to Mori is observed in Japan also. Of my cases, 9 (or 29.03 per cent.) were due to zymotic diarrhoea.

As for marasmus, pure and simple, that accounted for 7 (or 22.58 per cent.) of my thirty-one cases.

Finally, in two of the cases (6.45 per cent.) the cause of the corneal mischief remained obscure.

A clue to the cause of the corneal gangrene is sometimes given by the age of the child. Thus, the most likely factors during the first two or three months of life are prematurity, twin births, congenital syphilis, and infantile atrophy. Later cases are more commonly the result of xymotic diarrhoea, tuberculosis, or of insufficient or unsuitable food.

But when all is said and done, we shall not err greatly if we assume that destruction of the cornea may supervene, other things being favourable, in any baby whose nutrition is seriously impaired, whether as the result of disease, semi-starvation, or, for that matter, from any cause whatsoever.

Some systematic writers have spoken of the disease as though a fatal termination was inevitable. Hirschberg[2] was especially emphatic with regard to this point. "Notwithstanding the relatively mild symptoms present at the onset," he wrote, "the outcome of the disease is absolutely lethal." Knaebel (*loco citato*,[32] p. 6) spoke of keratomalacia "as nearly always a harbinger of impending death." Again, the statement made by Koun[51] (*loco citato*, p. 31) that "the appearance of keratomalacia is a sign of the impending dissolution of the little patient" is true only approximately.

That the underlying disease often ends fatally is unquestioned. A glance at any series of figures dealing with keratomalacia will at once show the truth of this statement. For example, of the eighteen cases reported by Knaebel[32], nine, or exactly one-half, died before they had reached the age of six months, two in the *Klinik* and seven at home. Death occurred in Braunschweig's[27] five cases—three in hospital, and two 12 and 25 days respectively after discharge from the Halle *Augenklinik*. In my own series of thirty-one cases the mortality amounted to thirteen, or 41.93 per cent. This number, however, is probably below the mark, inasmuch as some of my patients may have died soon after they passed from under my personal observation. Few can have been so fortunate as Baer[49], who saw five instances of keratomalacia, some of them severe, and who did not lose a single child. Again, Peltesohn[29] saw recovery ensue in two out of three cases. In the nine infantile cases of keratomalacia described by Thalberg[3], the mortality was one alone, or the remarkably small percentage of 11.11. Laas[50] believes that the prognosis *quoad vitam* is not so unfavourable as generally thought if suitable diet be given, a statement with which I find myself in accord.

I believe that the age has a good deal to do with the issue, lethal or otherwise. For instance, the average age of my non-fatal cases was 294.5 days as compared with 177.7 days in the fatal cases. In fact, the older the baby the better are the chances of recovery. Another thing, doubtless not devoid of influence, is whether the child is or is not admitted early into hospital, inasmuch as the chances of recovery are clearly better in the former than in the latter event. Syphilitic and marasmic cases, in my experience, justify a better prognosis than those which are due to tuberculosis.

The interval between admission to hospital and death in my thirteen fatal cases ranged from one day to one hundred and nineteen days, and averaged 29.23 days. These figures dispose of Koun's[51] statement, which is to the effect that the children die in from one to four days after the beginning of the corneal lesion.

It is a matter of common knowledge that babies affected with keratomalacia often die from broncho-pneumonia. That condition was found, either during life or after death, in more than one-third of my fatal cases, the exact figure being 38.46 per cent. In some instances the pulmonary condition is unquestionably in the nature of hypostatic pneumonia, which is so often the cause of the fatal termination in cases of marasmus. I cannot resist a suspicion, however, that in another, and perhaps a larger contingent, the broncho-pneumonia merely represents the outstanding symptoms of a generalised tuberculosis, which has escaped recognition.

As regards the cornea, the symptoms of keratomalacia may be summed up in the four words, *infiltration*, *ulceration*, *perforation*, and *cicatrisation*.

Both corneæ are usually affected, although not necessarily at the same moment or to the same extent. The disease was bilateral in 16 (59.25 per cent.) and unilateral in 11 (40.70 per cent.) of twenty-seven of my cases. In Knaebel's[32] eighteen cases the disease affected one eye in exactly one-half. Of the five cases published in detail by Braunschweig[27] the corneal condition was bilateral in but two. On the other hand, in Thalberg's[3] thirteen cases (9 infantile and 4 adult) both corneæ were involved in all but two.

The first sign that I have myself seen is a slight dulness of the epithelium in some part of the lower half of the cornea, and under suitable treatment (as in case No. 25 of my series)› this may clear and *restitutio ad integrum* come about. In the contrary event, the dulness is replaced by a definite infiltration of the corresponding part of the cornea. This may quickly spread, so that the entire cornea, excepting a narrow peripheral zone, in the worst cases, speedily becomes converted into a soft, greyishwhite, pulpy slough, resembling damp wash-leather. Trivial photophobia (revealed by the baby keeping its eyes closed) or a whitish appearance of the eye, of which more will be said later, may be, and often is, the first thing noticed by the baby's friends. There is rarely any pronounced swelling, redness, or spasm of the eyelids, so that on opening the eyes of the baby, one receives quite a shock on seeing the destruction that has taken place. Neither is there lacrymation, nor chemosis, nor congestion of the eyeball, nor, indeed, any of the other appearances that we should naturally expect to find associated with so severe and destructive an affection. Indeed, to employ the graphic words of one of the earlier writers, J. N. Fischer[52], the eyes "have a corpse-like appearance in the still living body." As pointed out by v. Graefe, however, symptoms of irritation may come on later—that is to say, if the baby survives long enough for panophthalmitis ot develop.

The eyes often look curiously dry and more or less insensitive to stimuli, and in severe cases a very striking and characteristic feature is that the baby scarcely resents attempts to examine its eyes, or, at most, moans feebly and piteously during the necessary manipulations. This alone should arouse suspicion as to the nature of the case, suggest extreme care in handling the eyes, and, finally, prompt a bad prognosis.

In one very remarkable case in an infant of eleven months (No. 29) the clinical picture was identical with that of *ulcus corneæ serpens* as seen in the adult eye. The lower fourth of one cornea (the other had perforated some days earlier) was occupied by a trench-like ulcer, the lower edge of which was rounded off, while the upper one was purulent and overhung with epithelium. There was hypopyon. Pneumococci were found in material taken from beneath the ledge of epithelium overhanging the ulceration of the cornea.

A common accompaniment of keratomalacia, first mentioned by von Graefe,[1] is a small, triangular, greasy-looking white patch—an area of so-called "xerosis"—situated in the ocular conjunctiva on the outer or the inner aspect of the cornea.* It may be present in one eye with a transparent cornea, while the cornea of the other eye may be partially or wholly destroyed by keratomalacia, as in Krausse and Knaebel's cases. In several of my own cases the patch of xerosis lay below the cornea, and I have more than once seen the change encroach upon the cornea itself. I have often observed the entire cornea, or a considerable portion of its circumference, encircled by a narrow, slightly raised, glistening white line, occupying the position of the limbus, the conjunctiva near which is sometimes lustreless, dry, and wrinkled concentrically. This curious ring may or may not be associated with the triangular xerotic areas in the ocular conjunctiva, which, in my experience, are much less common. It is doubtless due, like the triangular area, to the lodgment and multiplication *in situ* of the saprophytic and ubiquitous xerosis bacillus, together with local precipitation of the Meibomian secretion (Reymond). Once only have I seen the xerotic changes affect the palpebral conjunctiva. That was in the case of a child suffering severely from congenital syphilis, in whom each lower lid showed a dry, white, greasy-looking patch on its inner aspect. The changes of xerosis, as in case No. 25, may disappear in the course of a few days.

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*This condition was called by von Graefe "acute xerosis," and described by him as affecting the ocular conjunctiva, which became, especially below and at the sides of the cornea, dull and dry and covered with fine scales, and wrinkled and loose when the eyeball was moved.

That xerosis of the conjunctiva may be absent from cases of keratomalacia has been pointed out by Horner, Zirm, Leber, Biber, v. Hippel, and Krausse. Xerosis was not observed in one-quarter of the cases of keratomalacia, sixteen in number, seen by Braunschweig[27] in the Halle *Augenklinik*. The xerotic patches, as pointed out by several writers, are not essential to the diagnosis of keratomalacia, although when present in little children, they are almost pathognomonic of that ailment. They were noted in thirteen of my own cases, or 41.93 per cent., and in 46.15 per cent. of Thalberg's[3] thirteen cases. On the other hand, in Knaebel's[32] series they were present in no fewer than 83.3 per cent. of the eighteen cases, and in all of Baer's[49] four cases.

Finally, it should be added that when the globe becomes red, as in commencing panophthalmitis, the xerotic patches are no longer visible.

In one of Leber's cases ulcerations existed on the conjunctiva, ocular and palpebral.

If the baby's nutrition cannot be improved, the cornea is likely to perforate, a process usually ushered in by localized protrusions of Descemet's membrane, which manifest themselves as so many dark-coloured areas peeping through the pulpy, greyish slough, which covers, as a rule, most of the cornea. Hypopyon is common. Perforation is succeeded by escape of some of the contents of the eyeball, notably the crystalline lens, and the globe eventually shrivels up into a small, white, globular, sightless mass, lying in the depths of the orbit. In a second group of cases, the damaged eyeball, instead of undergoing phthisis bulbi, passes over into a state of secondary glaucoma, together with the remote bulging of its anterior segment, a so-called staphyloma. In still a third group the cornea becomes prominent without actual perforation having taken place (keratectasia). The result in any case is the same, namely, blindness. But the more common event in severe cases is for the baby to succumb to the underlying malady before there has been time for either phthisis bulbi or staphyloma to develop.

The singular paucity of inflammatory changes, especially of redness, has already been alluded to. But when the cornea has perforated, marked signs of reactionary inflammation are common. They may reach such a pitch, as in one of my cases (No. 15), as almost to arouse a suspicon that a gonorrhœal infection has been superadded to the keratomalacia. J. Thalberg[3] also mentions this point, and says that in two cases of the kind he reached the mistaken diagnosis of blennorrhœa with secondary gangrene of the cornea.

The destructive nature of the disease is shown by figures recently published by A. Schiele[53] dealing with thirty-three cases of keratomalacia seen in the Kursk district of Russia in the years 1904, 1905, and 1906. Thirteen of the children were rendered totally blind, and seven were blinded in one eye; two recovered with corneal blemishes; and eleven could not be traced. Of the nine children mentioned in Knabel's[32] series who survived, eleven of the thirteen eyes affected (*i. e.*, five unilateral and four bilateral cases), were known to have been blinded by the disease.

At the same time there are cases and cases of keratomalacia. Some are mild, and others just the reverse. It is important to bear in mind that the progress of the disease may be arrested at almost any stage, with the consequent retention of a more or less useful eye. The common condition in such cases is an incarceration of the iris in the leucoma (*leucoma adherens*), some times with the production of a capsular cataract, as happened in several of my own cases. Peltesohn[29] believes that the prognosis of the disease *quoad visum* is not so unfavourable as generally believed, since even in advanced corneal changes there may come about a restitution bordering on the miraculous.

Apart from the ocular appearances, the child presents the usual symptoms of marasmus—that is to say, progressive wasting, lax and withered skin, anæmia, characteristic look, subnormal temperature, and a marked tendency to diarrhœa and vomiting.

Cervical opisthotonos, the "retraction of the head" familar to every practitioner, was noted in several of my cases of keratomalacia (Nos. 4, 5, 6, 9, and 15), but in one alone (No. 4) did it appear to indicate meningitis, as proved by the *post-mortem* examination. The condition is not uncommon in young children, as well known, under several circumstances, as, for example, marasmus, diarrhœa, middle-ear catarrh, pneumonia, etc., although it is probably never so marked as in post-basic meningitis, where the infant's head may be approximated to its heels. A case published by R. Schultz[40] is worth mentioning in this connection.—A baby, aged five months, the thirteenth child of a very anæmic mother, showed ulceration of one and infiltration of the other cornea, associated in each case with a pale and dry conjunctiva, covered with whitish, fatty-looking mucus. There was marked retraction of the head, which finally reached an extreme degree. Death from broncho-pneumonia. Yet at the autopsy, brain and meninges were found to be normal.

The "hydrocephaloid state," sometimes seen in marasmus and diarrhœa, was present in one of my patients (No. 5).

The possibility of confusing marasmus with latent tuberculosis has been mentioned previously. A remittent temperature, which need not reach a high point, is more suggestive of tuberculosis than of marasmus, pure and simple. Under such circumstances it becomes of importance to examine the lungs at frequent intervals, and to investigate the condition of the spleen and lymph nodes. Cough is another symptom that should make us suspect the existence of tuberculosis, and so are quickened respirations without obvious cause.

Despite the wasting, the appetite in some of my patients has been so voracious as to recall Gouvêa's[6] remark, that those suffering from Brazilian ophthalmia "will eat anything that happens to be placed in their hands."*

The diagnosis of keratomalacia should offer no difficulty to one who is aware of the existence of the disease. It is important to bear in mind that neither the existence of xerosis nor the presence of corneal changes in both eyes is essential to the diagnosis. It would, in my opinion, be a fair generalisation to say that ulcers of the cornea, especially if bilateral, in infants between the ages of two and twelve months are far more likely to be due to keratomalacia than to any other cause. Such patients are too old for the corneal complications of gonorrhœal ophthalmia, and almost too young to suffer from the other great cause of corneal ulceration in children, *viz.*, eczematous keratitis. While this is true, it is curious to notice from the case-reports scattered throughout literature how often the symptoms of keratomalacia have been confused with those of ophthalmia neonatorum, notwithstanding the very different age-incidence of the two ailments. Indeed, sometimes the distinction between the diseases is not simple, as in one of my own cases (No. 30).

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*Ullersperger (5) gives an account of an adult with "Brazilian ophthalmia" whose appetite was so ravenous that an iron mask had to be put over his face for the purpose of preventing him from tearing to pieces all the fallen fruit he could lay hands on. On one occasion, when without his mask, Ullersperger's patient swallowed four ounces of spirits of champhor.

Confusion, however, is much more likely to arise between karatomalacia and two conditions, both of which occur in childhood: (1) keratitis xerotica, and (2) tropho-neurotic keratitis.

(1) *Keratitis xerotica* (Feuer) is liable to occur in children, irrespective of age, who lie for long together in the semi-conscious state known as "coma-vigil" from whatever cause. The semi-closed eyelids allow the lower third of the cornea to be exposed to the air. The consequence is that that portion of the cornea becomes dry, and this, along with the grave general state of the child, allows the damaged cornea to fall a ready prey to any pyogenic micro-organisms that may chance to be present in the conjunctival sac. An ulcer, shallow at first but soon becoming deeper, forms near the lower margin of the cornea, and, if the child live long enough, this becomes complicated with deeper changes, which may lead to loss of the eye. The affection, so far as I have seen, is invariably bilateral, and is of slow progress compared with the most cases of keratomalacia.

(2) *Trophoneurotic keratitis,* a rare and painless disease of which I have seen two instances only in children, is caused by paralysis of the fifth cranial nerve. It gives rise to a peculiar appearance of the cornea, since the entire anterior epithelium is cast off except for a narrow rim at the extreme periphery. In its further course the cornea becomes cloudy, pus appears in the anterior chamber, and the eye is lost by suppuration, or, at best, is left with a corneal cicatrix in which the prolapsed iris has become entangled. There is anæsthesia of the conjunctiva of the upper and lower eyelid on the affected side.

Almost everybody, from Dr. Joseph Brown downwards, who has written about keratomalacia has compared the process, aptly enough, with that brought about in dogs fed, as in Magendie's famous experiment, with sugar and distilled water or other non-azotised food. In those animals an early and constant sign of inanition was furnished, as everybody knows, by sloughing of the corneæ and consequent destruction of the eyeballs.

Indeed, it cannot be doubted that keratomalacia is remotely due to lowered vitality in a tissue devoid of blood-vessels and exposed to slight injuries. The fact that in almost 50 per cent. of the cases the affection is limited to one eye, suggests that slight, inappreciable traumatisms may have a considerable determining share in the causation of keratomalacia. A case of my own (No. 16) may be briefly mentioned in connection with this point.—An ill-nourished child of fourteen months suffered from a sloughing right cornea, and, as a congenital defect, there was an incomplete coloboma of the corresponding upper eyelid. The inference was that the gap had allowed of some slight injury, as by an intruding foreign body, of the exposed cornea. I recall another case (not included in the present series) of a wasted infant admitted with double coloboma of the left upper eyelid, who suffered from severe and perforative ulceration of the corresponding cornea.

The corneal changes, in fact, appear to be analogous to the localized gangrene of the skin over the sacrum, the heels, and other bony prominences which is sometimes observed towards the terminal stages of athrepsia. Such acute bed-sores, for that is what they amount to, were noted in cases of keratomalacia reported by Baer[49] and Lagrange[51] and by Cabannes and Koun[51] respectively. They existed in one of my own patients. By Förster[37], of Breslau, indeed, it was supposed that pressure of the eyelids upon the enfeebled cornea was enough to determine ulceration, much as pretibial bed-sores are believed to be produced in typhoid fever and other severe constitutional diseases by the mere weight of the bed clothes. This view seems to be supported by J. Thalberg[3].

Horner, Zirm, and other authors believed that the primary cause of the disease was to be found in desiccation of the corneal epithelium exposed by inadequate closure of the eyelids. My own experience does not support this view. At the same time the fact that the disease almost invariably begins in the lower half of the cornea is suggestive. Keratitis e lagophthalmo, which is unquestionably the result of exposure of the cornea, presents a different clinical picture. The fact that in almost one-half of the cases keratomalacia affects one eye alone is dead against this theory. Lastly, direct observation has convinced me that in the earliest stages of keratomalacia the lids are almost invariably kept shut, and that coma-vigil is seen only in the advanced stages—that is to say, when the patient has become dangerously ill and the mischief has already been done. My personal experience is borne out by a statement made by Krausse,[54] namely, that in the Jena *Augenklinik* one case alone of keratomalacia has been met with in which the lids were not closed completely. Many cases reported, however, including some of my own, expressly mention that the lids have kept more or less open.

I have learned to look with circumspection upon any corneal ulcer, no matter how trivial it may seem, in a baby who shows signs of malnutrition. A recent case (No. 26) points the necessity for this precaution.—A somewhat ill-nourished baby, aged eight months, suffered from symptoms of a mild conjunctivitis of the Koch-Weeks' type, and, in addition, from a trivial and localised dullness of one cornea. The cause of the corneal mischief was not immediately apparent. Unfortunately, no great importance was attached to the condition, and ordinary treatment was prescribed. A fortnight later, however, the baby again attended, and it was then seen that the condition of the cornea was most serious—it was sloughing and had a keratocele towards its centre. The patient was admitted to the Hospital, but too late to prevent the formation of an adherent leucoma.

Keratomalacia may be said to be a malady devoid of distinctive pathology. Dötsch[55], following the example of Ernst[56] and of Fuchs,[57] has insisted upon the importance to be attached to a deposition of keratohyalin in the superficial layers of the conjunctival epithelium, which he found to be present in the xerosis accompanying three cases of keratomalacia. This process of keratinisation he regarded as typical of the affection in question. These observations have been confirmed by Stephen Mayou[58] in so far as regards six cases of epithelial xerosis, an affection, as I have shown elsewhere,[59] not uncommon in England in the summer months amongst the inmates of poor-class residential schools. It is not, of course, associated with any destructive corneal processes. Mayou found a layer of keratin on the surface of the epithelium, with granules of keratohyalin in the deeper layers beneath it, and, further down still, a well-marked layer of prickle-cells. In Mayou's view, the essential change in the formation of the patches of xerosis is the keratinisation of the epithelium, to which the Meibomian secretion, known to include the xerosis bacillus, becomes adherent, owing to altered surface tension. Deficient lacrymal secretion is another factor in the causation of the change.

The coarse pathology of the case, however, will essentially depend upon the stage when the eye is examined. If before perforation has taken place, there will be more or less extended loss of the surface epithelium, an infiltration with round cells of the corneal lamellæ, together with other evidences of inflammation and ulceration of the cornea, about which there is nothing distinctive. Bowman's membrane will be missing from the ulcerated spot, while Descemet's membrane will persist practically unchanged. The iris and the ciliary body, even at this early stage, will manifest marked evidences of inflammation. When perforation has occurred, the pathological picture changes according to several circumstances, the chief of which are the length of time that has elapsed between perforation and removal of the eyeball, and the septic accidents that may befall the globe. The common pathological appearance, however, is that of an adhesion of iris to cornea by connective tissue, round cells, pigmented cells, and blood-vessels of new formation. The ciliary body, sclera, choroid, retina, and optic disc are in a state of exudative inflammation, so that the vitreous humour usually includes more or less abundant inflammatory exudation.

In this place there is no need to describe the pathology of keratectasia or of staphyloma or of secondary glaucoma.

If the pathology of keratomalacia be not distinctive, neither is the bacteriology. Despite many investigations by various authors, no casual micro-organism has yet been identified. The microbes found in discharge from the conjunctiva or in scrapings from the cornea have included xerosis bacilli, staphylococci, streptococci, pneumobacilli, coli bacteria, and gonoccocci, as well as various cocci and bacilli not more particularly identified. In a remarkable case by Angus McNab[60], the bacillus coli communis was found with gonococci. This diversity and multiplicity of bacteriological results is strongly suggestive of there being no micro-organism peculiar to keratomalacia.

My personal investigations lead me to the same conclusion.—(a) In the patches of conjunctival xerosis, I have never yet failed to find the xerosis bacillus, sometimes alone but oftener associated with the commoner micro-organisms of the conjunctival sac, especially with the staphylococcus pyogenes albus. (b) As regards material taken direct from the corneal ulceration, the findings have been somewhat different.—As I have pointed out elsewhere, the pneumococcus is by far the commonest pathogenic organism obtained under those circumstances. In eleven of the cases which form the basis of the present communication the pneumococcus was present in five (or 45.45 per cent.), in pure culture in two and mixed with other microbes in three. Other micro-organisms found by me included the staphylococcus pyogenes albus (5), the xerosis bacillus (4), the staphylococcus pyogenes aureus (1), the Morax-Axenfeld diplobacillus (1), the gonococcus (2), the micrococcus catarrhalis (1), sarcinæ (1), the aspergillus fumigatus (1), and, lastly, a Gram-positive streptobacillus, which coagulated and acidified litmus milk in twenty-four hours, and which fermented lactose.

In two of my cases (Nos. 30 and 31) the gonoccocus was found in scrapings from the affected corneæ. In both xerosis bacilli were also present. Xerosis conjunctivæ was present in each patient. In the one case (No. 31) the child's age, *viz.*, eight months, excluded anything like ophthalmia neonatorum, but in the other case (No. 30), the age was only six weeks, and there was a history of a mild non-bacterial conjunctivitis beginning a few days after birth. When the corneæ became affected, however, the symptoms of conjunctivitis were ill-marked, while those of sloughing cornea were characteristic, and xerosis conjunctivæ was present, in addition. Gonococci were found not only in discharge from the conjunctiva but also in scrapings from the corneæ, and were confirmed by repeated culture on blood-agar. The baby was somewhat ill-nourished (weight, 7 lbs. 13 ozs.). Of the two views, namely, that this was an instance either of very mild ophthalmia with corneal complications, or else of keratomalacia the evidence points, I think, to the latter being the true explanation. So far as I know, the case by Angus McNab is the only one yet published where the gonoccocus appeared to be the cause of keratomalacia, although there the bacillus coli communis was also present. These three cases, *i. e.*, McNab's and my own, suggest that the gonococcus may, on rare occasions, affect the cornea to the exclusion, complete or almost complete, of the conjunctiva.

The xerosis bacillus is now known to be a mere saprophyte, an almost constant inhabitant of the conjunctival sac, healthy or diseased. Hence, the name proposed, the *bacillus conjunctivæ communis*, by Arnold Lawson[61] for this ubiquitous microbe. Most of the other bacteria included in the list are common enough even in conjunctivæ that to all appearance are healthy. It is probable that no particular micro-organism is associated with keratomalacia, but that lowered vitality and all that such implies in the defensive powers of the body in general and of the cornea in particular is enough to allow the commoner pyogenic organisms to exert their characteristic properties, and in that way to bring about the malady. The fact that the pneumoccocus need not necessarily be present in keratomalacia proves that it is not essential to the suppurative process, although in my experience, it is the commonest cause of the latter. It has been found, in pure culture or otherwise by other observers besides myself—as, for example, by E. von Hippel[62], Knaebel[32], Braunschweig[27], and Doetsch[55].

We may conclude, then, that in no case has a specific microbe been found by any of the numerous observers who have investigated the bacteriology of keratomalacia.

The fact has already been mentioned casually that in four cases of syphilitic keratomalacia I succeeded in demonstrating the spirochæta pallida in scrapings from the diseased corneæ. In one case (No. 20) the discovery clinched an otherwise doubtful diagnosis.—The infant, aged three months, "snuffled," was wasted, and showed a few small ulcerated papules about the anus, together with slight splenic and hepatic enlargements. Both corneæ had sloughed. The syphilitic origin of the ocular symptoms was merely suspected until all doubt upon the point was laid at rest by the actual discovery of the treponemata.

Treatment.

The first requirement is to place the baby under the best possible conditions for recovery, and that is obviously in the hospital ward, where the details of feeding can be attended to properly, local remedies can be applied systematically, and where the child can be kept warm, if necessary in an incubator. The affection is one where careful nursing counts for a great deal, another reason (if one be needed) for treating the patient in hospital. It would, in my opinion, be an excellent rule in the casualty department of every children's hospital to admit for observation any badly-nourished baby who showed xerosis conjunctivæ or the least ulceration of the cornea. J. Thalberg[3] established such a practice at the Elizabeth Children's Hospital at St. Petersburg.

Treatment itself should be both *general* and *local.*

The *general treatment,* speaking broadly, is that suitable for marasmus. It includes the provision of a wet-nurse, if possible, and, anyhow, the administration of such food, predigested or otherwise, as the baby can be induced to take and retain. Rotch[63] recommends that a milk mixture should be given "which contains a low percentage of fat, a high percentage of sugar, and a moderate percentage of proteids." Such a mixture is represented by the formula: fat, 0.5; sugar, 6.00; proteids, 1.00; lime water to 5.00. "Virol," an emulsion of bone marrow, yolk of egg, and malt extract, has appeared to me to be beneficial in these babies. Baer,[49] whose exceptionally happy experiences have been mentioned earlier, advocated the feeding of the babies with milk and lime water. His treatment, in fact, consisted of little else! Holmes Spicer[13] recommended the administration of milk, properly diluted, cod liver oil, and raw meat juice.

The giving of alcohol in the form of brandy has seemed to me to be most useful. The first hint I had as to the value of stimulants in keratomalacia was gained from a case that fell under my notice several years ago.—A little boy, aged 12 months, was brought to me with the right cornea hazy. He was a tuberculous subject. A week later, despite the use of physostigmine, the cornea was represented by a grayish white slough, the size of a three-penny bit, separated by a shallow trench from the unaffected parts. The eyeball was scarcely reddened, but, curiously enough, the upper retro-tarsal fold was extremely prominent, as the result of œdematous infiltration. The corneal process was associated with the presence of the staphylococcus pyogenes albus and sarcinæ. The baby was admitted to Hospital, but owing to some misunderstanding, was removed by his mother, an exceptionally ignorant, stupid, and obstinate person, after a few days' stay. Feeling interested in the case, I traced the child to his home in one of the poorest parts of London. The cornea was then disorganized, and the infant, reduced to skin and bone, and as yellow as a guinea, appeared to me to be on the verge of death. The mother, in answer to my enquiries, told me that the child was being fed on "drops of brandy." Some two years later, to my great surprise, the child, then in blooming health, was brought to the out-patient department of the Queen's Hospital, on account of a large staphyloma which had developed in the eye with keratomalacia. Operation was refused, but eventually the staphyloma was sunken by an accidental blow upon the eye.

Cod-liver oil has a distinct value, more especially if it be given not by the mouth but by inunction, say, of one drachm three or four times a day. It was recommended by Holmes Spicer[13] in 1893, who suggested that in cases where it could not be retained, a little cream might be substituted. Mori,[8] indeed, believes that keratomalacia is essentially due to a deficiency of fat. On this view, he has, in spite of the diarrhœa often present, used cod-liver oil, and by that means has succeeded in curing even severe cases of Japanese "Hikan." Neatsfoot oil, an old fashioned remedy for wasting children in English country districts, has seemed to me to be as valuable as cod-liver oil, than which it is certainly more economical.

If syphilis be present, mercury must be given. The fact is significant that some of the cases of keratomalacia that have recovered (Zirm, Peltesohn, Evans) have done so under specific treatment. The rapidity of action, desirable in these desperate cases, is probably best secured by giving mercury with chalk, gr. ½ to gr. 1, three times a day, and by rubbing in fifteen grains—*i. e.*, a piece roughly of the size of a pea—of mercurial ointment every night. In order to prevent the medicine from being carried off by the bowels, it is advisable to combine with each dose of the mercurial gr. ½ of sodium bicarbonate and gr. 1 of aromatic powder of chalk. Sublimate baths were employed in one of Peltesohn's cases which got well. Intra-muscular injections of a soluble mercurial seem out-of-place in babies of tender age, a remark that applies with added force to intravenous injections.

The *local treatment* of the eyes will include the frequent use of douches of hot saline or boric lotion. By Gama Lobo and de Gouvêa great importance was attached to steam, at a temperature of 40° C., directed against the closed eyelids of the patient for fifteen minutes once a day or oftener. In the intervals between the application of the steam, the eyes were kept closed by means of a pressure-bandage. However this may be, hot boric fomentations are certainly of use both in limiting necrosis and in hastening separation of the slough.

Among antiseptics, those that have rendered me yoeman service are argyrol and quinine and hydrogen peroxide. The first-named has been employed as a 15 per cent. to 25 per cent. solution dropped into the eyes at frequent intervals. The second has generally been used, as recommended by Arnold Lawson,[64] as a lotion containing four grains of quinine sulphate to the ounce of distilled water, just enough sulphuric acid being added to ensure a clear solution. The quinine is freely applied to the eyes every four hours, and in the intervals, they are kept tied up with gauze soaked in the lotion. Hydrogen peroxide, employed as Merck's "perhydrol," serves several useful purposes in these cases. To begin with, it is a most efficient antiseptic, and has the advantage—no slight one in keratomalacia—of being perfectly innocuous. Secondly, it yields accurate information as to the progress of the corneal ulceration, for evolution of gas when the "perhydrol" is brought into contact with the ulcer, becomes less and less marked as the latter heals. To obtain the best results, however, the baby's eyelids should be separated by retractors (if necessary under general anæsthesia), and the "perhydrol" be allowed to form, as it were, a pool of liquid, at the bottom of which lies the cornea. Several editions of the "perhydrol" are employed, and the process is repeated once or twice a day.

The employment of physostigmine, strongly recommended by J. Thalberg,[2] who saw much of the disease in Russia, is endorsed by Holmes Spicer[13] and by Adolf Knaebel.[32] Thalberg laid some stress upon the use of an ointment containing about ½ per cent. of physostigmine in vaseline, as opposed to the use of a watery solution. The alkaloid might equally well be dissolved in sterile oil. My own experience has led me to place a high value upon physostigmine, which assuredly succeeds better than anything else I have tried in keratomalacia, unless it be pilocarpine. Now and then it is surprising to see how quickly the cornea casts it slough under the use of the remedy.

If the gangrene of the cornea can be mastered, the physostigmine should be replaced by artopine, also in oily solution.

It need scarcely be added that during the more acute stages of the disease the eyes should be kept tied up with a pad and bandage, and that the utmost care should be exercised in making the necessary examinations, applications, and so forth. The importance of care in this respect is shown by cases reported by Thalberg[3] and Biber[65] respectively, where the lens escaped from the eyes of babies on attempting to separate the eyelids. A precisely similar accident happned in one of my own cases.

As to surgical measures, I have seen an ulcer go on to perforation despite energetic treatment, as by scraping and the application of liquified carbolic acid, and the use of the galvano- or thermo-cautery. Several such cases are mentioned in the schedule to this communication. In keratomalacia it seems as if the vital powers were at so low an ebb that the cornea is unable to furnish the reaction necessary to healing. But that objection can scarcely be raised to the adoption of the Saemisch (or, rather, Guthrie) section, from which I have seen benefit when the cornea was falling into a state of keratectasia.* A remarkable case has been published by Dr. Thomas C. Evans[22] in which a large staphyloma, resulting from keratomalacia in a baby, was treated by multiple punctures with a Graefe knife. The operation was repeated at intervals of about a week for five weeks, at the end of which time the staphyloma is stated to have been replaced by a flattened corneal cicatrix, while the eye retained its shape and tension was normal.

If the baby's eyelids are incompletely closed it will be advisable to suture them together, as in a case mentioned by Knaebel (*loco citato*[32], case No. 11), or to perform tarsorrhaphy. The ingenious little contrivance described by Dr. L. M. Francis[66], of Buffalo, would appear likely to be of service under these conditions. A piece of gauze is cemented to the upper and the lower eyelid by means of flexible collodion. A silk thread with its free ends towards the outer canthus is placed in the creases, and the flaps of gauze are turned over and cemented to the fixed pieces of gauze. Then, by tying the ends of the thread, the edges of the lids are brought into apposition.

Conclusions.

1. Keratomalacia in young children is known to occur in practically every country the scientific records of which are available for inspection.
2. It affects children whose ages usually range from three to twenty months, and is especially frequent at about the eighth month of life.
3. It occurs chiefly in the children of the poorer classes.
4. It affects both eyes in about one-half of the babies.
5. It is associated with xerosis conjunctivæ in about 50 per cent. of the cases.
6. It occurs only in babies whose vitality has been seriously reduced by "epidemic" or "zymottic enteritis," congenital syphilis, athrepsia, or tuberculosis, named in their order of frequency.
7. In London its seasonal incidence closely follows that of zymotic enteritis.
8. Its mortality amounts to about 50 per cent. of those affected. The immediate cause of death is usually broncho-pneumonia or exhaustion.
9. It leads to blindness in about one-half of the children who survive.

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*The operation of Kerotomy, as described in The Ophthalmoscope of November, 1909, may also be usefully employed.

10. It is associated with no specific micro-organism, although in scrapings from the cornea the pneumococcus may be found in about one-half of the cases.

CASES OF KERATOMALACIA.

1.—Latham, Grace, 8 months. Admitted August 25th, 1897. Died August 26th, 1897.

History.—Born at term, the 12th, in the family. Stated to have had no food other than her mother's milk. Although she has suffered from bronchitis since she was born, still she is stated to have been otherwise healthy until four months ago. Her general condition has become much worse during the last week. Five days before coming under notice, the mother noticed "a speck" on the baby's left eye, which is said to be sometimes "a little open during sleep."

Upon Admission.—A wretchedly thin and marasmic infant, weighing seven pounds. Her skin is wrinkled and yellowish. No teeth. Temperature 97° F. L. E.—a small quantity of yellowish-white discharge is present. A circular infiltration, 2mm. in diameter, lies near the centre of the inner side of the cornea, and there is a layer of yellowish pus in the lower part of the anterior chamber. No patches of conjunctival xerosis. There is hardly any redness of the eye, which looks dry, as it were. During sleep there is slight lagophthalmos of the lid.

Treatment and Progress.—Admitted to Hospital. Brandy and a mixture containing ipecuanha and ammonia given. The baby died at 4. a. m. on August 26th, 1897.

Post-Mortem Examination.

A mass of cretaceous pus on vortex of right hemisphere below the pia mater, size of a one shilling piece. No meningitis. Brain otherwise normal. A cavity, the size of a small filbert, lies towards the base of the upper lobe, of the right lung. Pleura around thickened, and universally adherent. The rest of the upper lobe contained numerous miliary tubercles. The other lung was healthy. No tubercle could be found in the other viscera.

Pathological examination of the affected Eye.

The central parts of the cornea are attenuated, the anterior epithelium being reduced to from one to three layers of flattened cells, and Bowman's membrane being absent. The cornea, as a whole, shows a dense infiltration with leucocytes. The vessels of the iris and ciliary body are gorged with blood. Both those structures are thickened and densely infiltrated, forming beautiful microscopical specimens of instensely inflamed tissues. The pigmented epithelium of the iris is in place. The angles of the anterior chamber filled with a fibrinous exudation included numerous pus cells and some pigmented particles. A similar exudation lines the posterior surface of the cornea, being now thick and again thin according to the exact part examined. No lens in specimen. Pars ciliaris retinæ covered with a layer of exudation. Retina, choriod, and sclera all inflamed and more or less disorganised.

2.—Maskell, Emily, 1 year. First attendance March 16, 1898.

History.—A full-time child, born after an easy labour. A fine baby, quite healthy. For the first three months fed on breast exclusively, and after that breast and bread and biscuits. The breast was given up in January—that is to say, when the baby was about ten months' old. The food since then has included Nestle's milk, fish and potatoes. On *February 20th* the baby was taken with diarrhœa (stools loose and green) and sickness. She was cutting two teeth at the time. The child vomited every time she was fed, and the stools were very offsensive. She wasted, and lay quite still in bed all day long. Convulsions also made their appearance. This illness is said to have lasted for fourteen days, and since its end the child "has picked up very well." Further questioning brings out the additional facts that the baby was dangerously ill for three days, never moved, and kept the eyes shut. A yellow discharge was then present, and a medical man, who opened the eyes, stated that "ulcers were present."

Present Condition.—R. E., adherent leucoma present in the lower-inner part of the cornea. L. E., a large scooped-out ulcer present in the lower part of the cornea, but without perforation. No redness of eyes, and no frothy conjuntival patches.

Progress—April 6th, 1898. No redness of eyes.

3.—Brown, James W., 10 months. Admitted August 17th, 1898. Died September 8th, 1898.

History.—The baby has suffered from diarrhœa for about six weeks, and the eyes have been affected for some seven days. The baby has been brought to this hospital as a casualty, and some lotion was given, but the eyes have failed to improve. The baby does not sleep with open lids.

Upon Admission.—A very thin, wasted and weakly baby. Has diarrhœa. A large sloughing ulceration is present over the lower part of each cornea. No frothy patches on ocular conjunctiva. Signs of inflammation not at all pronounced.

Progress and Treatment.—The corneal ulcers were touched with the liquified carbolic acid of the British Pharmacopæia. The after-treatment included drops of atropine and cocaine, and hot formentations applied to the eyes every four hours. *August 19th.*—Iodoform to be dusted twice a day over the corneal ulcerations. *August 23rd*—Baby seems better. No diarrhœa. Pupils not much dilated, but the corneal ulcerations are looking better. Ung. Flav. et Atrop., bis die. Atropine drops to be continued. *August 27th.*—Although the eyes have improved, the boy itself is not so well, and diarrhœa has started again. *September 7th.*—Child much emaciated. It lies with semi-closed eyelids, and presents at the lower third of each cornea a dense opacity, the surface of which is somewhat depressed. Pupils dilated;they are free from adhesions. No pus in anterior chamber. Corneal sensibility unimpaired. *September 6th.* —Baby suddenly became worse and died this evening.

Until the morning of August 29th the temperature remained below 99.4°F. On the day named, however, it was on successive occasions 99.6° F., 100°F., and the next day in the morning 102° F., but by night had fallen to 97.8° F. From then to death, nine days later it remained subnormal.

Stools 0 to 4 a day.

No *post-mortem* examination could be obtained.

4.—Thornhill, Walter, 8 months. Admitted December 14th, 1898 Died Frebuary 5th, 1899.

History.—The baby, when about six months of age, attended Moorefields, where a diagnosis of purulent ophthalmia was made. Dates of attendance were from September 22nd to November 15th. The left eye is said to have been affected for a week. Six days ago a speck was noticed upon that eye and the speck is stated to have got bigger since.

Condition on Admission.—A weakly-looking baby, with eczema behind the ears. L. E., the lower and outer quadrant of the cornea is occupied by a slough, the remainder of the cornea being cloudy. No pus can be seen in the anterior chamber. Palpebral conjunctiva reddened. Muco-purulent discharge. There is a good deal of ciliary congestion.

Treatment and Progress.—Under A. C. E., the slough was scraped away, without opening the cornea, and pure liquified carbolic acid was immediately applied to the floor and edges of the ulcer. Atropine drops (grs. 2), ter die; iodoform to ulcer, bis; pad and bandage. *December 16th.*—There is not much change in the condition of the eye, the pupil of which has not responded in the least to atropine. Sores on face and head. *December 19th.*—Child seems ill in himself. Cervical opisthotonos. L. E., lids swollen. Conjunctiva reddened, and some muco-purulent discharge. Ciliary redness rather less marked. Cornea rather clearer, but whitish slough lies over position of abscess. It is, however, difficult to obtain a good view of the cornea even with retractors, as the child persistently turns the eye outwards. Pupil not dilated. *December 23rd.*—Perforation lower part left cornea with prolapse of the iris. Pupil not dilated, in spite of the atropine (drops and solid) that has been applied and the leech used to the temple. *December 29th.*—Lids less swollen. There are one or two pinkish patches in the cornea, the substance of which is cloudy. Pupil not well dilated. Sores are still present on the face and head. *January 11th*, 1899.—Mercurial inunction and Hydr. c. Cret., gr. 1, *omne nocte*. Child drowsy and languid. Some nasal discharge. Sores have healed. The lungs show no physical signs, but the baby is evidently ill. The left eye is better, and the conjunctiva clear. *January 18th.*—Temperature has become very intermittent, and the pulse is occasionally a little irregular. There is nothing definite in the right fundus oculi, but it seems indistinct. *January 25th.*—Baby is undoubtedly worse. More drowsy. Pulse 100, irregular, compressible. Mercurials stopped. *January 28th.*—Brandy, thirty drops every two hours. *February 1st.*—Temperature rose suddenly to 102° F. Respirations 48, with a tendency to the Cheyne-Stokes character. Child very drowsy. *February 2nd.*—Takes food badly. Pulse small and irregular. Respirations, 36 to 48 per minute, markedly Cheyne-Stokes in character. *February 3rd.*—Baby restless. Respirations 56 per minute, shallow and less markedly of the Cheyne-Stokes character. Pulse, irregular, 108 per minute. Temperature 98° F. and 99.4 F. Baby fed with nasal tube. *February 4th.*—Baby evidently sinking. Pronounced pallor. Respirations, shallow, 88 to the minute. Pulse 172, thready. In evening child became restless, unable to take any nourishment, and at 10 o'clock p. m. temperature rose to 107° F. At 11 o'clock p. m. two minims of morphia injected. The child died at 3.25 p. m. on February 5th, 1899.

Stools.—1 to 2 motions daily during stay in Hospital.

Temperature.—Temperature remained about normal until January 5th, when it rose to 101.6° F. On the evening of January 6th, it fell to normal, and remained so until January 13th. It then alternated from 97.8° F. to 100.4° F. until January 31st. On February 1st it rose to 102.2° F. On February 4th the evening temperature reached 106.6° F. The temperatures recorded on the day of the baby's death were—99.4° F., 97° F., and 97.4° F.

Pulse and Respirations.—February 1st P. 116, and R. 48; February 2nd, P. 96, and R. 36; February 3rd, P. 108, and R. 56; and February 4th, P. 172, and R. 88.

Post-Mortem Examination.

February 6th, 1899.—Body very wasted. Left eye shows signs of severe inflammation. Pleurae: no adhesions and no excess of fluid. Lungs: no signs of tubercle and healthy. No evidence of tuberculous softening in the bronchial or mesenteric glands. Pericardium: neither adhesions nor excess of fluid. Heart: healthy; orifices contracted. Valves: healthy. Brain: very soft in places, especially left frontal lobe; no tubercle seen on arteries or on surface of brain. No actual abcess, but excess of purulent fluid in ventricles, and purulent exudation on basal surface. Abdomen, spleen, kidneys, genito-urinary tract, liver, and alimentary canal free from morbid changes. Eye (left): signs of acute inflammation; the optic nerve manifested no naked-eye evidences of inflammation.

Diagnosis: general meningitis.

Examination of the Eye.

Macroscopic.—Leucoma with adhesion of the central parts of the iris and the anterior pole of the lens to the cornea.

5.—Payne, Selina, aged 6 months. Attended Evelina Hospital on July 20th, 1900. Death on July 30th, 1900.

History.—This child, the third in the family, was born at term after a natural labour. The eyes have always been "weak," and running with yellowish-white matter since birth. The nose also has run continuously.

On July 14th the baby was seized with diarrhœa and convulsions. On the 16th she was brought as an out-patient to the Evelina Hospital, where she was treated with bismuth and a mixture containing castor oil.

The bowels are said to act at least ten times a day, and the stools are watery, of light colour, and offensive to the sense of smell. There is now no vomiting. The baby has been losing flesh quickly. She is said to be subject to "inwardly convulsions," during which the eyes get fixed and the arms and legs became stiff. Since the illness began on July 14th the child has been noticed to sleep with her eyes half-open, and to throw her head back.

The baby was fed on the breast for the first month of her life. Since then she has had no other food except boiled nursery biscuits, together with milk and barley water (equal parts).

On admission.—A wasted baby, who weighs 10 lbs. 12 ozs. She suffers from diarrhœa and vomiting. The retraction of the head and the "scaphoid" abdomen suggest that she may be suffering from basal meningitis. Her temperature is of a very fluctuating character, reaching 103.2° F. on one occasion.

Eyes.—The corneæ are clear. The pecularity of the case is that the lower half of each cornea is encircled by a narrow glistening white line at the limbus, and in addition to that, a small area of xerosis lies in the conjunctiva on the outer side of each cornea.

Both corneæ at a later stage in the case began to slough, but unfortunately the notes give no more precise details. It is, however, certain that the baby died ten days after she was first seen by me.

Bacteriological Report.—Cover- glasses were smeared and serum tubes inoculated from the whitish material lying at the limbus. The former contained Gram-positive cocci and bacilli, which were identified by culture as staphylococcus pyogenes albus and xerosis bacillus.

6—Bennett, Ernest, 4 months. Admitted to the Queen's Hospital on February 26th, 1902. Death on May 17th, 1902.

Baby brought to out-patients on February 26th, 1902, suffering from ulceration of the corneæ. He was a full-time child, and said to have been well-nourished at birth. A week after birth he refused to "suck," and since then has been fed with great difficulty on cows' milk and barley water. No history of ophthalmia neonatorum. Never "snuffles" nor has any rashes nor other signs of congenital syphilis. The child stated to have had a "fit" on the eighth day after birth. It is the youngest of four children, of whom the other three are said to be healthy. The eyes are stated to have been bad for about one month.

On admission.—He is a puny, apathetic, wasted baby, weighing in the nude 8½ lbs. only. There is no evidence of syphilis. T. 97.4° F. R. E. a small infiltration lies towards the centre of the of the corneæ and stains faintly when treated with fluorescein. T. n. L. E., a large and dense infiltration, which stains deeply with fluorescein, covers the centre of the cornea. There is merely a trace of ciliary redness. The eye looks dry, as it were. No inflammatory changes in the eyelids. No changes in the palpebral conjunctiva. Tear passages normal. T. n. The eyes can be examined and cleansed without the baby evincing the least sign of discomfort. Its silence and apathy, indeed, are striking features of the case.

Admitted to the Hospital.

Treatment and Progress.—*February 27th.*—Patient seems to be more lively. Takes milk fairly well. Brandy, five drops every two hours. *March 5th.*—Child now weighs 7½ lbs., so that he has lost one pound since admission to the hospital. T. has not risen above 99.8° F. The bowels are usually opened three times a day, but sometimes not at all. Head is retracted. R. E. ulcer has healed, and is now replaced by a small more or less central nebula. L. E. trifling dusky ciliary redness. The entire pupil is hidden behind a purulent ulcer of the cornea. Pus can be recognised towards the outer side of the anterior chamber. The almost complete apathy of the infant is very marked. No physical signs in the chest or abdomen. *March 7th* —Condition much the same. Head is, however, more retracted, and since yesterday there has been a discharge from both ears. A few rhonchi to be heard in the lungs. R. E. condition unchanged. L. E. ciliary redness more marked. There is a clear spot in the center of the ulceration (keratocele). The hypopyon has spread to the upper part of the anterior chamber. Patient takes food rather better. *March 9th* —The whole of the left cornea is now involved by the purulent infiltration, and the cornea is in the point of perforating. The cornea surrounded by injected zone. Child's general condition is about the same —still takes milk well. Otorrhœa. No retraction of head during last week. During the last few days the ulceration has extended and the whole cornea is now covered with a white slough, in the centre of which is a clear area, gradually increasing in size. Vascularity of the ocular conjunctiva has increased, and there is now a very distinct ring of radially arranged dilated vessels around the edge of the cornea. When seen at 11 p. m. child was in its usual condition. On being looked at ten minutes afterwards, however, the ulcer was found to have perforated, and the extruded crystalline lens to be lying outside the eye at the inner canthus. The vitreous was bulging towards into the opening in the cornea. This untoward event has not in any way disturbed the patient's equanimity. *March 10th.*—Opening in cornea now concealed by a whitish material. Eyelids inflamed. *March 12th* Weight 7 lbs. The left eyeball is in a condition of panophthalmitis, and is somewhat proptosed. *March 18th.*—The left eye is quite disorganized, and is discharging pus. No inflammation of eyelids now. *March 19th.*—Weight 7 lbs. General condition unchanged. Left eye still discharging. *March 26th.*—No change. Weight, 7 lbs. *April 2nd.*—Weight, 6¾ lbs. General condition is unchanged. The left eyeball is now shrunken, discharges but little, and signs of inflammation have almost disappeared. Mist. ol. morrh. et ferri, one drachm three times a day. *May 7th.*—The left eye is now represented by a small nodule, free from redness, lying in the orbit. A button of granulation tissue exists in the former site of the cornea. Physical signs being detected in the baby's chest, I requested by colleague, Dr. J. H. Sequeria, to examine the case. His report is appended:

"There is evident consolidation of the left upper lobe, with breaking down of the lung. There are enlarged glands in the mesentery, and the spleen also is enlarged, being easily palpable a finger's breadth below the costal margin. I consider the lung and glands certainly, and possibly also the splenic trouble, as tuberculous."

May 13*th*.—Local conditions unchanged. *May* 17*th*., 1902.—Death. Autopsy refused.

During the three months the baby remained in hospital successive weights were: 8½lbs., 7½ lbs., 7 lbs., 6¾ lbs., 7 lbs., 6¾ lbs., 7 lbs., and 6¼ lbs.

7—Barnett, Kathleen, 7 months. Out-patient June 11th, 1903, to June 18th, 1903. Admitted June 18th, 1903. Discharged August 6th, 1903.

History.—Patient, the 14th child, born at term. For three weeks the patient was on the breast, and since then has been brought up on Ridge's food and Nestle's milk, given together. The mother suffers from paralysis agitans. The 12th child in the family, a girl, died when three months of age, with eyes like those of the present patient—"almost out of its head at last," to quote the mother's own words.

Present state.—When seen as an out-patient the child's condition was as under:

A pallid, wasted baby, weighing nude 10 lbs., affected with lichen urticatus and evidently very ill. No purulent discharge from the eyes. Each cornea is ulcerated. Lies apathetically in mother's arms. Cries feebly when touched. Thrush on palate, etc. R. cornea shows a keratocele in lower-inner quadrant of cornea, surrounded by a sloughy infiltration. About one-third of the left cornea is involved by an ulcer covered with a greyish-white slough. A very small, white, glistening, scaly patch of xerosis lies in the ocular conjunctiva of each eye on the outer side of the cornea. Eserine drops (grs. ii.) thrice a day and the eyes meanwhile to be kept tied up. Cow's milk and meat-juice prescribed.

A week later (June 18th, 1903) the baby's condition was so much worse that she was admitted into the hospital.

Upon admission.—Baby is very white and extremely apathetic, so that attempts to examine the eyes are scarcely resented. R. E. the cornea is sloughing with a keratocele at the lower-inner part. L. E. one-third of the cornea is engaged in a greyish-white slough. T. 99.8°

F., and 98.4° F. Eyes to be treated with compressive bandage, hot boric fomentations, and physostigmine (2 grains to the ounce). Generally, milk, lime water, Valentine's meat juice, strychnine, and syrup of the iodide of iron, thirty drops three times a day.

Treatment and Progress.—*June 20th.*—Weight 10 lbs. *June 22nd.* T. 98° F., and 101.4° F. Condition of eyes about the same. There is some bronchitis, but no evidence of tubercle can be obtained. *June 23rd.*—One drachm of brandy three times a day. *June 25th.*—T. 97.6° F., and 98.6° F. P. 120 R. 32. Child rather better, with a more vigorous cry. Food taken well. Eyes now free from redness and xerotic patches. Adherent leucomata in R. down and in., and in L. below. In each eye part of the pupil is visible. Baby looks as if she might recover. *June 26th.*—T. 98.4° F. morning and evening. P. 132 R. 32. Weight 10¼ lbs. *July 1st.*—T. 98° F. and 98.4° F. Weight 11 lbs. Baby taking food well. During the last week there has been a frequent cough. *July 2nd.*—Neither redness of eyes nor xerotic patches now present. R. E. a small adherent leucoma lower-inner quadrant of cornea. L. E. small adherent leucoma immediately below pupil. The baby has gained three-quarters of a pound since admission to the hospital. Brandy, physostigmine, and boric fomentations to be continued. *July 6th.*—Child examined by my medical colleague, Dr. George Carpenter, who was kind enough to make the following note:

> "The infant is obviously rickety. The ribs are markedly beaded, and the long bones are plus. She is a little pale. Has a little bronchitis and probably adenoids (there are post-nasal 'snuffles'). Pot-bellied. Spleen and liver a finger's breadth below costal margin. No evidence of tubercle and nothing to suggest tubercle."

July 16th.—Weight 11½ lbs. *July 22nd.*—General condition of child better. It takes its food well, and is gaining weight. The eyes remain much in the same condition as noted already. *July 23rd.* and *July 31st.*—Weight 11½ lbs. *August 6th.*—Weight 11½ lbs. Baby now quite well. Eyes free from redness, with adherent leucomata as noted. Baby discharged, cured, from hospital.

The child, now aged 2½ years, was again seen on April 13th, 1905 —*i. e.*, twenty months after her discharge from Hospital—on account of phlyctenular conjunctivitis affecting the eye. She was still a miserable looking child, weighing, naked, only 11 lb. 4 ozs. There was a small adherent leucoma in the lower nasal quadrant of the right and in the lower fourth of the left cornea. From the position of these leucomata no very serious impairment of sight should be produced.

8.—Crockett, Thomas, 1 year. Admitted August 6th, 1903. Discharged November 17th, 1903.

History.—The child was fed on the breast for three months, and since then on Nestle's milk and barley water. Biscuits and cakes have been given to him at times, but usually "he has not kept them down."

One month ago the child had measles, and since then has wasted away and has been fretful. The left eye is stated to have got bad three weeks ago. It appeared to be red, was continually running, and was usually kept closed tightly. Is the fifth child in the family.

On admission.—The baby looks ill, and is badly nourished, weighing 9¼ lbs. R. E. in the centre of the cornea is an epithelial denudation, which stains with fluorescein. L. E. a leucoma adherens lies below the centre of the cornea. A suggestion of xerosis is seen below the leucoma.

Treatment and Progress.—Brandy, one drachm every six hours. Atropine drops twice a day. Both eyes to be kept covered with a pad and bandage. *August 24th.*—Since admission the child has gained half a pound in weight. He seems vigorous. The temperature kept about normal until the 20th insant, when it rose at night to 100° F. Since then the evening temperatures have been 98.4° F., 102° F., 101.2° F. The recorded temperatures today have been 99° F., 97.6° F., 100° F., and 98.2° F. A glandular enlargement is present on the left side of the neck. *August 26th.*—The temperature since date of last note has still shown a tendency to rise at night to 100° F., 101° F., and once to 102° F. The swelling in the neck is smaller. *September 9th.*—Although the swelling in the neck is smaller, yet it is now soft and fluctuating. An incision evacuated pus. The baby is gaining weight. Condition of eyes much the same. *September 28th.*—Since the operation the temperature has kept about normal. The child since admission has gained three-quarters of a pound, and has altogether improved. *October 1st.*—Atropine to be replaced by yellow ointment, applied last thing at night to the eyes. *October 25th.*—Child does not gain in weight, being still only 9¼ lbs. Both pupils react to light, the right better than the left. R. E. appears to be normal. L. E. the whole cornea is more or less cloudy, and the leucoma adherens remains as noted. Mist. Ol. Morrhuæ c. Ferro, one drachm thrice a day. *November 12th.* 1903.—The eyes present no signs of inflammation. The lower half of the left pupil is covered by a small adherent leucoma. *November 17th,* 1903.—Discharged.

Weight.—Successive weights were as follows: 9¼ lbs., 9¼ lbs., 9¼lbs., 9¾ lbs., 9¾ lbs., 9¾ lbs., 10 lbs., 10 lbs., 10¼ lbs., 10¼ lbs., 10 lbs., 10¼ lbs., 10½ lbs., 10¾ lbs.

Stools.—Motions varied from 0 to 3 a day. *Pulse* 144 to 168 per minute, and *Respirations* 32 to 40 a minute.

When seen as an out-patient on *November 26th*, 1903, the right eye showed no change, while as regards the left, a leucoma adherens was present below the centre of the cornea.

9.—Tofts, Sarah, 8 months. Admitted to Queen's Hospital, June 11th, 1903. Died October 8th, 1903.

Baby born at term. Child fed on cow's milk and barley water, and then with Nestle's milk. Child has always been ailing. Five weeks ago she was vaccinated, and since then has wasted, and, as the mother says, "the eyes got bad through vaccination."

On admission.—The baby is markedly wasted, weighs 9¾ lbs., is feeble, pallid, and looks ill. Bridge of nose slightly depressed. Universal lichen urticatus. Coppery papules about anus. Urine 1010, pale, free from albumen. T. 97.6° F. R. E. a white patch of xerosis lies in the ocular conjunctiva on the inner and the outer side of the cornea, which shows a perforated ulcer. L. E. a yellowish slough (notes say "staphyloma") covers two-thirds of the cornea. Xerotic patches as in right eye. The child was admitted to the Hospital, and the treatment prescribed included boric fomentations every four hours, inunctions of mercurial ointment, brandy one drachm every four hours, milk, and Valentine's meat juice.

Progress and treatment.—*June 14th.*—T. 97° F. and 98° F. *June 17th.*—"Brown pustules now present both corneæ." Weight 9¾ lbs. *June 22nd.*—General condition better than on admission. Retracted head. Kernig's sign slightly present; T. 97° F. *June 25th.*—T. 98.4° F. and 98° F. The child, who is better in herself, has now a vigorous cry. *July 1st.*—Although the baby has a voracious appetite, she does not seem to be making much progress. However, she has gained 4 ozs. since admission, since her present weight is 10 lbs. T. 98.4° F. No redness of eyes or xerotic patches. Leucoma adherens in both eyes. *July 6th.*—For the following note I am indebted to my medical colleague, Dr. George Carpenter:

"This infant has a cluster of *cutaneous gummata* on the right buttock, and a 'blind boil' on the right loin. The ribs are beaded, but otherwise there is nothing special pointing to rickets. The head is retracted, and if interfered with, it arches its back and its head and heels approximate, although they do not touch. The retraction of the head varies from time to time. Baby is not anæmic. It cried and whined during examination. I did not obtain any evidence of tubercle, and my impression is that it is *a syphilitic child.* It has marked 'snuffles' and craniotabes. Muscles and bones normal. Nourishment of body might be considerably worse."

July 22nd.—Child does not seem to improve despite the administration of mercury and chalk, of which one grain twice a day was prescribed on July 8th. *July 23rd.*—One grain of mercury with chalk four times a day. *August 3rd.*—Weight (10 lbs.) stationary during the last three weeks. *August 6th.*—Brandy two drachms every four hours. *September 1st.*—Weight 9½ lbs. The rash is better at times. She suffers from recurrent attacks of boils (?cutaneous gummata). *September 16th.*—Weight 9 lbs. T. 98° F. and 98.2°. *September 23rd.*—Weight 8½ lbs. T. 98° F. and T. 98.2° F. From September 25th to September 29th the temperature rose on two occasions to 101° F. and 101.4° F., and showed several smaller elevations. *September 30th.*—T. 97.4° F., 98° F., 98.2° F., and 98° F. The child is much weaker. Weight 8½ lbs. Diarrhœa with offensive stools. Lids of left eye swollen on awaking this morning. *October 8th.*—General condition became gradually worse, and the baby died in an asthenic state at 6 p. m. today. The temperature has been normal or slightly subnormal since the 3rd instant.

Stools.—From the date of admission (June 11th) to July 28th the stools varied from one to three a day. They then increased in number from two to six a day, and this continued without material alteration until the infant's death on October 8th, 1903.

Weights.—Successive weights were: (Admission) 9¾ lbs.; (June 17th) 9¾ lbs.; June 24th) 9¾ lbs.; (June 30th) 10 lbs.; (July 8th) 10 lbs.; (July 15th) 10 lbs.; (July 22nd) 10 lbs.; (July 29th) 10 lbs.; (August 5th) 9¾ lbs.; (August 12th) 9½ lbs.; (August 19th) 9½ lbs.; (August 26th) 9¾ lbs.; (September 2nd) 9½ lbs.; (September 9th) 9½ lbs.; (September 16th) 9lbs; (September 23rd) 8½ lbs.; (September 30th) 8½ lbs.; and (October 7th) 8½ lbs.

Post-mortem Examination.

Autopsy was made twenty hours after death. Rigor mortis present. Body extremely wasted and marantic, with old, wizened apearance of face. No superficial swellings. Heart: small and pale. Lungs: œdema of bases and slight bronchitis, no consolidation. Liver: very full of blood, large, not fibrotic, darkly bile-stained. Spleen and kidneys normal. Mesenteric glands: a few show slight enlargement; no tubercle. Intestines: very shrunken, no ulceration. Brain: marantic, wasted, especially frontal region. Excess of fluid. No trace of meningitis. No tubercle in substance or on surface.

Pathological Examination of the Eyes.

(First Eye.)—The cornea varies much in thickness, and is mainly converted into vascular fibronuclear tissue, to the back of which the remains of the iris are wholly adherent. It is covered by an irregular layer of epithelium, the cells of which are more or less uneven, stain badly, and are vacuolated. Particles of pigment, derived from the iris, are present in the thickest parts of the pseudo-cornea. No trace of Bowman's membrane can be made out. Descemet's membrane, in some of the sections, can be found towards the periphery of the anterior chamber. Ciliary body pigmented and atrophied. Peripheral zone of lens markedly vacuolated. Lying upon the anterior pole of the lens, below the capsule, is a small pyramidal mass of laminated tissue, staining almost homogeneously with eosin. Some remains of the anterior capsular epithelium seen between this cataract and the capsule. Sclera, choroid, retina, and optic nerve all show signs of inflammation, as evidenced by distension of vessels and hypernucleation. In certain specimens Descemet's membrane can be recognised towards angle of the anterior chamber, between cornea and iris, with its free end coiled up.

(Second Eye.)—The specimen contains no crystalline lens. The corneal lamellæ, altered in direction, infiltrated with small round cells, and containing blood-vessels, extend from the limbus for a longer or shorter distance into the cornea, and are then replaced by tissue possessing a very remote resemblance to corneal tissue proper. Descement's membrane could be recognised in places, but no trace of Bowman's membrane could be seen. The pseudo-cornea, as it may be called, is covered in front with imbricated and irregular epithelium, and behind by proliferating and hyperplastic uveal pigment, and is made up of round cells, fibres, blood vessels, and pigmented cells. Its central parts, extremely attenuated, consisting of round and pigment cells merely, even the anterior epitheloma being missing in most of the sections examined. The iris, much changed in texture, is adherent to the cornea, and takes part with the latter in forming the pseudo-cornea. The ciliary processes are stretched towards the axis of the globe, while extending across, from one side to the other, is a fibro-cellular exudation of inflammatory products derived from the processes. Ciliary muscle, sub-conjunctival tissue, choriod, retina, and sclera, as far as they could be examined, were infiltrated with small round cells.

10.—Graves, Rossetta, 12 months. Admitted to the Queen's Hospital for Children, London, on March 30th, 1903, and discharged April 24th, 1903.

History.—The patient, who was born towards the end of the eighth month of pregnancy, has been fed upon the breast, with an occasional crust. She is the fifth in the family. One child died at 3½ years from scarlet fever. The others are alive and well.

As a baby she was never strong. For the last seven weeks she has been suffering from "bronchitis," according to her mother's statement, and during her illness, discharge has been noticed to run from her eyes and nose. For three or four days she lay in a state of coma-vigil, and a week ago, when her medical attendant opened the lids, he found that her left eye was inflamed. He therefore recommended that she be sent to the Hospital. His diagnosis of the case is said to have been "meningitis."

Present state (*March* 23*rd*, 1903).—The child (examined in the out-patient department) is white and evidently very ill. She "snuffles," but there is no history of syphilis. There is stiffness of the neck, and Kernig's sign appears to be present.

The right cornea is clear, but the case is very different as regards the left cornea, three-fourths of which are converted into a yellowish, pultaceous mass, evidently representing a sloughing ulceration which has perforated. Though the relatively clear portion of the cornea, which is situated upwards and outwards, it can be seen that the iris has become incorporated with the slough. No xerosis present.

Progress and Treatment.—Hot boric fomentations and powdered iodoform locally to the left eye.

The child was admitted as an in-patient under my care a week after she was first seen, and on the following day the ulcer of the left cornea was treated with the galvano-cautery. The following report upon the child's general condition was made by my colleague, the late Dr. George Carpenter:

> "The child has a large head and widely patent fontanelle, which is flattened and not raised. There is a chronic discharge from the nose, and by digital examination adenoids can be felt. The ends of the long bones are not enlarged nor are the ribs tender, and apart from the potbelly and widely open fontanelle, the child does not appear to be ricketty. The spleen is enlarged, but the liver is not so (two fingers below the ribs.) The limbs are short for the trunk. The forearms seem specially short and the leg bones generally. The child has lichen urticatus. She is a little pale but not markedly so. There is some scarring over the left index metarcarpo-phalangeal joint, said to be secondary to rubbing her nose when she was ill. The child appears to be of defective intellect. It has no notion of sitting up. It moves its limbs. The condition of the trunk and short limbs is rather like achondroplasia. There is no evidence of syphilis. The child can hold up its head. There are two symmetrical holes on either side of the sagittal suture, about three inches from the lambdoidal suture."

The child was discharged from Hospital on *March* 30*th*, 1903, with the ulcer replaced by a partial staphyloma of the left cornea.

On *May* 21*st*, 1903, the child attended as an out-patient. She was better in herself. There was a large adherent leucoma of the left cornea. On *June* 25*th*, 1903, she attended again. Her colour was ghastly, and she was wretchedly thin, weighing only 14 lbs., although she was fifteen months old. When her eyes were examined, she moaned feebly instead of crying as a more vigorous child would have done. The right eye was normal. The left eye showed a large adherent leucoma.

11.—Carpenter, Frederick, 7 days. Admitted to Evelina Hospital under Dr. Nestor Tirard, on October 17, 1904. Died November 13th, 1904. An eight months child.

On admission, very jaundiced, but sclera not much affected. Weight 4¼ lbs. Umbilicus healthy. Heart and lungs healthy. T. 96.2° F. and 97° F. Umbilicus healthy. Heart and lungs healthy. T. 96.2° F. eyes. A diagnosis was made of syphilitic cirrhosis of the liver. On the following day the left cornea looked steamy, and the iris reacted sluggishly to light. On October 22nd the cornea of that eye appeared to be sloughing. *October 22nd.*—A lotion containing two grains of the acid hydrochloride of quinine to the ounce of distilled water to be used to the affected eye every four hours. *October 24th.*—L. E., the whole of the corneal epithelium is shed except for a narorw rim concentric with the limbus. A diagnosis of keratomalacia was made. No micro-organisms could be found either in cover-glass preparations or in tubes of nutrient material inoculated with discharge from the affected eye. *October 26th.*—Physostigmine drops, gr. 1 to the ounce, to be used three times a day. *November 3rd.*—Dr. Leathem, pathologist to the Hospital, reports that cocci, in pairs and in small groups, staining with Gram, and that xerosis bacilli were found in smears and in culture tubes inoculated from the affected eye. *November 12th.*—Eye perforated and allowed lens to escape this day. *November 13th*—Baby died suddenly at 1:55 p. m. after a stay in Hospital of twenty-seven days.

From three days after the date of admission until November 11th the baby was kept in an incubator.

Weights—On admission, 4¼ lbs.; October 20th, 4 lbs. 6 ozs.; October 26th, 4 lbs. 6 ozs.; November 2nd, 4¼ lbs.; and November 9th, 4½ lbs. *Temperature.*—From admission to October 22nd, temperature very irregular, reaching at 6.30 a. m. on the 19th of October 105° F. Onwards until death the temperature then was subnormal, except on one occasion when it was normal (98.4° F.), and on two other occasions, when it reached 98.6° F. It is to be noted that the temperature had been below the normal line for the six days immediately preceding death. *Respirations.*—They ranged from 24 to 48 per minute. *Pulse.*—100 to 160 per minute. *Stools.*—The motions varied from 2 to 7 a day after October 18th . On the day of admission and the following day there was no action of the bowels.

Report of post-mortem examination made on November 14th, 1904—Nutrition poor. Weight 4 lbs. Rigor mortis absent. Hypostasis slight. Body deeply jaundiced. Keratomalacia of left eye (removed for subsequent examination). Mesenteric glands normal. Liver small, flaccid, very dark in colour. Gall bladder contains a small amount dark yellow bile, which can be forced into the duodenum. Spleen normal. Supra-renal bodies large and of dark colour. Kidneys normal.

Postscript to the above protocol:—"Sections of liver do not show any definite fibrosis. There are a few very small intercellular collections of small round cells. The smallest bile channels contain bile, but none is seen in the bile ducts in the portal canals. The liver is congested."—A. N. Leathem.

12.—H. ——, Violet, aged 8 months, attended my out-patient department at the Queen's Hospital for Children on March 16, 1905.

History.—The baby was born at term, and then appeared to be healthy. She has been fed upon cow's milk since birth. When aged two months, she began to fall away and to suffer from diarrhœa and vomiting. She attended the Hospital as an out-patient from September 15th to October 6th, 1904, and recovered under treatment with calomel, bismuth, and salol. Barley water was prescribed with the cow's milk.

About a month ago the baby again began to waste, and has continued to waste ever since. There has been diarrhœa (four to eight stools a day) but no vomiting. Five days ago (March 11th) the mother noticed "something white" over the baby's eyes, and for four days the baby has lain with her eyes covered by her hands, and has moaned without cessation. She is the first child.

On admission.—A miserable-looking baby, weighing (nude) 9 lbs. 8 ozs. It cries feebly and moans during the whole time it is being examined. There is no redness or swelling of the eyelids, which are kept constantly shut. Although there is no discharge of muco-pus, yet there is a slight running of water from between the palpebral fissures. The eyeballs manifest little redness. Both corneæ are converted into greyish-white sloughs, except for a narrow peripheral portion, 1.5 mm. to 2 mm. wide. The limbus is slightly raised, and it forms, as it were, a narrow glistening band which encircles the gangrenous corneæ. In addition to the limbal change, there is a small triangular area of dry and greasy-looking xerosis in the ocular conjunctiva on the outer side of each cornea. At the upper and inner part of the right cornea is a small black spot, representing a prolapse of the iris at an early stage.

13.—Ficken, Sarah, 8 months. Admitted Queen's Hospital for Children on March 10th, 1906, and died on March 28th, 1906.

Attended Dr. S. Neave's out-patients on March 10th, 1906, on account of cough, wasting, and conjunctivitis. Admitted to eye ward on same day. The baby had been fed on Nestle's milk since birth, and for the last two months Ridge's food had been given, in addition to the milk.

On admission.—A marasmic baby, weighing 9 lbs., T. 99° F. R. E.—Slight conjunctivitis with discharge. L. E.—Cornea hazy, with leucoma over lower part.

Treatment and Progress.—*March* 16*th*, 1906.—"Nasty ulcer of left cornea. Pus in anterior chamber." *March* 19*th*, 1906.—Ulcer larger, and cornea generally hazy. There is still pus in the anterior chamber. An anæsthetic was administered, and the ulcer cauterised with the galvano-cautery. *March* 22*nd*, 1906 (baby seen for first time by me). —Base of ulcer is bulging forward, and appears as if about to perforate. The yellow appearance of the lower segment of the cornea has disappeared. Child improving. *March* 26*th*, 1906.—Child worse the last two days. Fontanelle and eyes sunken. Motions loose, offensive, white, and pasty. Temperature, previously subnormal, has risen today to 99° F. Signs of consolidation of both bases behind. Condition of cornea much as before. *March* 27*th*, 1906.—Child much worse. Consolidation of lungs extending. *March* 28*th*, 1906.—Child died at 3.35 a. m.

Treatment included boric lotion, argyrol (25 per cent.), dionine (5 per cent.), perchloride lotion (1:6,000), and atropine (grs. 4). Baby fed on milk and lime water, and brandy administered. Internally, adrenaline, strychnine, mercury with chalk, and ipecacuanha were given.

Temperature.—The temperature showed a tendency to rise almost every day to between 100° F. and 101.8° F. and to sink to 97° F. or even a little lower. The elevation occurred sometimes in the morning and sometimes in the evening.

Bowels.—The stools ranged from 1 to 5 *per diem*.

Weight.—Successive weights were: 9 lbs., 9¼ lbs., and 9½ lbs.

Post-mortem Examination.

External appearance.—Wasted but not extremely thin baby.

Pleuræ.—Healthy except over consolidated areas of lungs, where there was a granular appearance.

Lungs.—Consolidation of both lower lobes from confluent broncho-pneumonia.

Bronchial Glands.—Not enlarged.

Mesenteric Glands.—Slightly enlarged, but no evidence of tubercle.

Pericardium.—Healthy.

Heart.—Nothing noteworthy.

Abdomen.—A curious mixing up of the large and small intestines presented itself. The greater part of the small intestines were situated in the upper half of the abdomen, but passing into the midst of this was a coil of large intestine. The greater part of the large intestine lay below and to the left. The mixing up of the small and large intestines was due to the fact that all were enclosed in one mesentery and the folding of this mesentery had caused partial volvulus of a portion of the small intestine and large intestine, causing a certain amount of constriction. The attachment of the mesentery ran obliquely from the point of origin of left renal vein to the left sacro-iliac joint. The great omentum came off the lower border of the stomach and passed downwards to transverse colon and ascending colon. On the left it formed part of the covering of the spleen and a fold below it resembling the spleno-colic ligament.

Spleen.—Nothing noteworthy. *Stomach.*—Ditto.

Small intestine.—Ditto.

Large intestine.—Constricted about juncture of ascending and transverse colon, where partial twisting had occurred.

Pathological Examination of Eyeball.

The left eyeball was hardened in formol (5%), frozen, and cut into three portions by meridianal incisions. The upper and the lower parts were rejected, and the middle part was divided into an anterior and a posterior segment. After the usual preparations, these were embedded in celloidin, and cut for the microscope.

1.—*The anterior segment.*—Over most of the lower half of the cornea, Bowman's membrane and the anterior epithelium were missing, or, at the most, traces of the first-named could be recognised here and there. This portion of the cornea was ulcerated, and its substantia propria contained masses of small round inflammatory cells. The remainder of the cornea showed œdema and a restricted number of inflammatory cells. Some inflammatory cellular effusion was present towards the angles of the anterior chamber. The iris contained dilated vessels, and many small round inflammatory cells. Its uveal layer was adherent here and there to the anterior capsule of the crystalline lens (*posterior synechiæ*). The meshes of the suspensory ligament were crowded with inflammatory cells, apparently derived from the ciliary body, which manifested evidences of interstitial inflammation. Such cells were also found in the hyaloid membrane.

2.—*The posterior segment.*—General inflammatory changes.

14.—Raven, Leonard, 11 months. Admitted Evelina Hospital August 8th, 1905, and discharged October 3rd, 1905.

History.—Admitted as an out-patient, under Dr. Whipham, on August 4th, 1905, suffering from diarrhœa and vomiting. Baby said to have been ailing for three weeks. Motions, of normal colour, three a day. Weight, 12 lbs. 5 ozs. Corneal ulcer on one eye. The sixth child in family. Born at term. Breast until eight months, and then gravy, potatoes, milk puddings, barley water and milk. Biscuits, bread and butter, and eggs also given. At 10 months, diarrhœa with offensive motions, and wasting.

When the baby was first seen in the ophthalmic department on August 8th, 1905, the following notes were made:

Five days ago, according to the mother's statement, a small speck was noticed on the left eye. No photophobia, lacrymation, or discharge is present; baby seems to have no pain. L. E.: a white swelling is present over the lower part of the cornea, but does not quite reach the sclero-corneal junction. It seems to be solid, and to have increased in concentric rings. Its surface is shiny, and some fine vessels appear to be present under the surface. Pupil contracted. No hypopyon. Marked conjunctival congestion. Muco-purulent discharge.

A diagnosis of keratomalacia was made, and the child taken into the Hospital.

Upon admission.—A markedly athrepsic infant, moaning feebly and manifesting a slough covering, roughly, the lower half of the left cornea. Signs of inflammation not well marked. No xerotic patches in either eye. Child examined generally with negative result. White spots on palate and sides of mouth. The latter is red and sore. There are several sores on the buttocks.

Bacteriology.—Blood-agar was inoculated with a scraping from the affected cornea. After incubation, the surface of the medium showed small, translucent, greyish colonies. Films stained from these showed a coccus occurring in pairs and small groups, probably the pneumococcus. The coccus was inoculated into a rabbit. The animal died in about thirty-six hours, and its heart blood was found to be crowded with pneumococci.

Treatment and progress.—Physostigmine sulphate, gr. 1 to the ounce, to the left eye every three hours. *August 14th.*—Half an ounce of cod-liver oil to be rubbed into the skin twice a day. *August 15th.*—Baby has lost one ounce since admission. L. E. entire cornea, except for a peripheral zone ½mm. to 1mm. in width, occupied by a bulging slough with protrusion of Descemet's membrane. No patches of xerosis. R. E. unaffected. *August 22nd.*—A tiny perforation of the left cornea has occurred, and the tension of the eyeball is low. *Septem-*

ber 1st.—Mist. acidi co., two drachms thrice a day. *September 2nd.*—The child has gained in weight, and her general condition has improved. Child now opens affected eye well and there is no congestion. The pupil is occluded by a bulgnig leucoma adherens, and the tension is raised. *October 3rd.*—Child now bright and well, weighing 44½ lbs. Opens his left eye readily. No redness, discharge, or lacrymation. Tension not raised. The lower three-fourths of the cornea is occupied by an adherent leucoma, which entirely occludes the pupil. The central part of the corneal cicatrix is apparently thinned, and is of a darkish colour.

Weight.—Successive weights during the baby's stay in hospital: On admission, 12 lbs. 5 ozs.; (August 15th) 12 lbs. 4 ozs.; (August 22nd) 12 lbs. 12 ozs.; (August 29th) 13 lbs.; (September 5th) 13 lbs. 2 ozs.; (September 12th) 13 lbs. 8 ozs.; (September 13th) 13 lbs. 12 ozs.; (September 26th) 14 lbs. 4 ozs.; (October 3rd) 14 lbs. 8 ozs.

Temperature.—On admission, 99.8° F. and on the following morning 100.4° F. Until August 30th it remained subnormal except on four occasions, the highest point touched being 98.8° F. From August 31st to September 4th the temperature oscillated between 96° F. and 100° F. It then fell to below the normal line, and remained there with insignificant variations until the date of the child's leaving the hospital.

Stools.—The motions varied in number from 1 to 7 a day.

Subsequent Notes made in the Out-patient Department.

November 28th, 1905.—Weight 22½ lbs. A staphyloma is present involving almost the whole of the left cornea. Tension raised. The child appears to be in some pain with the eye.

15.—Caley, Leonard, 9 months. Admitted to the Queen's Hospital on July 30th, 1906, and discharged on December 21st, 1906. Admitted with keratomalacia (R. E.).

On Admission.—Broncho-pneumonia (double). Some retraction of head. Temperature, 100.2° F. Weight, 10½ lbs. R. E. An ulcer which occupies the greater part of the cornea has perforated, and the remainder of the cornea is hazy. Tension low. The ocular conjunctiva has lost its lustre, and has a greyish hue. L. E. The ocular conjunctiva as in right eye, but there is no ulceration of the cornea.

Progress and Treatment.—Milk, barley water and cream. Brandy, ℳ. XXX, every six hours. Physostigmine (gr. 1 to the ounce) to the eyes every six hours. Warm boric acid lotion often. Nasal feeding as baby takes food badly. *August 2nd,* 1906.—Child is being fed by mouth today. Retraction of head still present. Tubular breathing can be heard in right axilla. Baby lies with properly closed eyelids, which although a little oedematous, are scarcely reddened. He resists examination of his eyes, the condition of which is as follows.—R. E. The greater part of the cornea is occupied by a slough of greyish-yellow colour, only 2 mm. of the corneæ being left intact. The inner half of the slough shows a keratocele. L. E. Not inflamed. Xerosis conjunctiva still present. The lower third of the cornea shows slight dulness and loss of the epithelium. *August 9th*, 1906.—The upper lid of the right eye is now red and swollen, resembling the conditon found in gonorrhœal ophthalmia. There is chemosis of the ocular conjunctiva. The cornea is clearer than it was, although there is still a slough at some parts of its margin. A darkish body, clearly the crystalline lens, can be seen, when baby struggles, through the valve-like opening that involves the outer periphery of the cornea. L. E.—no external signs of inflammation . A shallow ulcer involves the lower third of the cornea, the rest of which structure is clear. No white lines at limbus. Brandy every four hours. Meat juice added to the diet. *August 12th*, 1906.—Taking food fairly well. Temperature 104.6° F. Tubular breathing heard all over right lung in front. Crepitations on left side and also at right base. *August 13th*, 1906.—The right cornea has perforated, and allowed the lens to escape. The latter body was found on the pad when dressing the eye. The cornea now presents a more or less circular aperature, with a sharp edge at the point of perforation. *August 16th*, 1906.—R. E.—Child is very ill. R. E.—Symptoms are subsiding, and the central parts of the cornea through which lens escaped three days ago are covered by a slough. L. E.—A definite ulceration, some 1.5 mm. in diameter, lies below the centre of the cornea. Eyeball is somewhat red. *August 28th*, 1906.—R. E. swelling and redness of eyelids and protrusion of globe, which is in a condition of panophthalmitis. L. E.—Signs of inflammation not pronounced, although there is a keratocele towards the center of the lower third of the cornea. *September 5th*, 1906.—Retraction of head still present, and baby's general condition not so good. Although he is taking food well, he has lost 1¼ lbs. during the last fortnight. Scattered over both lungs rhonchi and tubular breathing can be heard. Otorrhœa right side and enlarged preauricular land. *October 3rd*, 1906.—Condition of child varies considerably from day to day. Head retraction not constant. Despite the fact that he takes his food well, is losing flesh. R. E.—The shrunken globe now appears as a small yellowish body, of very low tension, with a dark coloured central portion. L. E.—The keratocele towards the lower third of the cornea is still present. *October 10th*, 1906.—Head more retracted. Child, who is restless, screams occasionally. The baby has gained ¼ lb. in weight. *October 29th*, 1906.—Patient, whose general condition is really bettered, has gained one pound in weight since the 10th instant. Condition of eyes unchanged. *Noevmber 8th*, 1906.—R. E. a shrunken stump. L. E.—The leucoma adherens which is present entirely occludes the pupil. Tension normal. Nurse thinks child cannot see with left eye. As regards himself, the child is doing moderately well. *November 15th*, 1906.—Iridectomy attempted on left eye. *November 28th*, 1906.—Conditon of child greatly improved.

Successive weights were 10½ lbs.; 10¾ lbs.; 11 lbs.; 10¾ lbs.; 11 lbs.; 11 lbs.; 11¼ lbs.; 10½ lbs.; 10 lbs.; 10 lbs.; 10 lbs; 10¼ lbs.; 10¼ lbs.; 10½ lbs.; 11 lbs.; 11¼ lbs.; 11 lbs.; 11¼ lbs.; 11½ lbs.; 11¾ lbs.; 12 lbs.; 12¼ lbs.; 12¾ lbs.; 12¾ lbs.; 13 lbs.; (on discharge) 13 lbs.

Bacteriological report.—On August 2nd, 1906, smears and cultures were made from scrapings obtained from the right cornea. In smears a rod-shaped bacillus, Gram-positive, not acid-fast, was present. It had about the size of the Klebs-Löffler organism, but did not show polar staining. After twenty-four hours at 37° C. a pure culture of the same organism was found in the serum tubes. There was no growth on the agar tubes at the end of thirty-six hours. The bacillus did not give an acid reaction in neutral bouillon. It was identified as the xerosis bacillus.

16.—Saunders, Charles, aged 14 months. Admitted Queen's Hospital on October 4th, 1906, and discharged January 30th, 1907.

History.—Before this neglected-looking infant had chicken-pox at eleven months, he was in good general health and had nothing wrong with his eyes. There has been no vomiting, but he has suffered from diarrhœa for one month.

On Admission.—Weight 12¾ lbs. Neglected sores on occiput. R. E., lids somewhat red and swollen. What appears to be an incomplete congenital coloboma is present towards the free edge of the middle of the upper eyelid. The ocular conjunctiva is reddened. The central region of the cornea is converted into a slough, and is protruberant. L. E., unaffected.

Progress and Treatment.—Milk diet with cream. Brandy, 30 drops every four hours. Cod liver oil and malt. Inunctions of cod liver oil. Boric fomentations and physostigmine drops (gr. 1) every four hours. *October 7th*, 1906.—Child now taking its food well. The right cornea is much clearer, and there is less discharge from the eye. *October 11th*, 1906.—Child is better in every way. The right cornea has not perforated, although the greater part of it is now represented by a keratocele. Medium symptoms of inflammation. No physical signs found in chest or abdomen. *October 16th*, 1906.—The patient has some bronchitis. *October 29th*, 1906.—Child has gained nearly one pound since admission to hospital. The bronchitis is better, and he takes food well. Hydrogen peroxide to eye *ter die*. *November 1st*, 1906.—The right cornea is in a condition of keratectasia. *December 28th*, 1906.—General condition of child satisfactory. Child opens his right eye, of which there is no redness. Coloboma of lid, of course, present.

Successive weights were—(admission) 12½ lbs.; 12¾ lbs.; 13 lbs.; 13¼ lbs.; 13½ lbs.; 13¾ lbs.; 14 lbs.; 14½ lbs.; 14¾ lbs.; 15¼ lbs.; 15¾ lbs.; 16¼ lbs.; and on discharge 16¾ lbs.

17.—Thomas, Estella, 7 months. Admitted to Queen's Hospital for Children on June 7th, 1906, and discharged September 3rd, 1906. Estella is the seventh child. She was healthy until six weeks ago, when she was put upon the bottle. Since then "she has fallen away." There has been neither diarrhœa nor vomiting.

About three weeks ago both upper lids began to swell, and a fortnight ago, a whitish appearance of both eyes was noticed.

Two of the children of the family have died from diarrhœa and vomiting.

On admission.—Eyes examined under chloroform; R. E., no redness of eye. A creamy patch of xerosis lies in the ocular conjunctiva below and to the outer side of the cornea. A small area having a similar appearance lies just below the centre of the cornea. L. E., slight redness of eyeball. An ulcer, which is on the point of perforating, lies over the centre of the cornea. There is a *plaque* of epithelial xerosis in the ocular conjunctiva on the outer aspect of the cornea.

Although the child is very feeble, there are no definite physical signs in chest or abdomen. Weight, 10¼ lbs. Temperature, 97° F.

Progress and Treatment.—Baby placed upon milk, lime water and cream. Raw meat juice also given. Brandy, m.Xv, every four hours. Locally, quinine lotion (grs. 4 to the ounce) kept applied on pads to the eyes, and physostigmine (grs. 2 to the ounce) dropped into the eyes every four hours. *June 14th*, 1906.—The left cornea has perforated. Inunctions of neat's-foot oil. Weight 10½ lbs. *June 20th*, 1906.—Fine crepitations heard all over chest, most marked over right lower lobe. No enlarged glands can be felt in abdomen, neither can the liver nor spleen be palpated. Weight 10½ lbs. *July 26th*, 1906.—The child now weighs 10½ lbs., seems better in herself. She rolls her eyes about aimlessly, and is evidently blind. R. E., the pupil is occluded by an adherent leucoma, which covers the central parts of the cornea. L. E., the orbit is occupied by a shrunken stump. *August 2nd*, 1906.—Harsh breathing over both lungs, but most marked over upper lobes. The apex of the right upper lobe is dull and breathing over this area is of a somewhat tubular character, especially behind. Some enlarged glands can be felt in the right iliac fossa. The child, believed by the nurse in charge of the ward to be quite blind, is taking her food well, and has improved in general health. Weight 10½ lbs. *August 16th*, 1906.—Breath sounds rather harsh all over lungs, together with an occasional rhonchus. A few slightly enlarged glands in the neck. Weight 11 lbs.

18.—The patient, a male, Francis Jones, aged seven weeks, was admitted on October 11th, 1906, and died on the 22nd.

He was the youngest of eight children, of whom four survived; there have been two miscarriages in addition. The infant, who was born at term, remained well until he was five weeks old, when he began to waste, "snuffled," and developed a rash upon the face and buttocks.

On admission.—He was found to be a miserable-looking, "snuffling" infant, and weighed (nude) 8½ lbs. There were extensive copper-coloured rashes and superficial ulcerations on the buttocks, thighs, face, and angles of the mouth. The right eye showed merely a slight inflammation of the conjunctiva, such as is not infrequently present in syphilitic babies during the eruptive stage. The left cornea, however, was covered with an ash-grey slough, through the lower part of which a protrusion of Descemet's membrane (keratocele) could be recognised. On October 18th the right cornea was affected, and it was noted as an unusual feature of the case that dry, white patches of xerosis, were present upon the conjunctiva of both upper and lower lids. The baby, who had the hoarse and raucous cry characteristic of a syphilitic infant, was extremely ill, although the skin eruptions were fading and the cutaneous ulcerations were healing. On the 19th the right cornea looked as if it had been cauterised with silver nitrate—it was of ashen hue, with an irregular and gibbous surface. The child died on the 22nd. No autopsy.

Treponemata were found in scrapings from both the corneæ, taken on several different occasions.

19.—William Chandler, aged nine months, was admitted on February 7th, 1907, and was discharged on April 5th.

The left eye was stated to have been bad for a month. The signs of congenital syphilis included frontal bosses, "snuffles," depressed bridge of nose, and a subcutaneous gumma of one thigh. A sloughy and unhealthy-looking ulcer of large size occupied the central parts of the left cornea, but no marked reaction, such as redness or watering of the eye, was present. The child opens the eye well. He weighed 10½ lbs. On February 14th the notes stated that towards the center of the lower third of the left cornea was a small ulceration, through which Descemet's membrane protruded when the baby cried. Symptoms of inflammation were not at all pronounced. The child has improved in general health. On the 21st the child's general condition was better and the corneal ulcer was healing. On March 14th the left cornea showed a leucoma, to which the iris was adherent, in its lower third, and a small anterior pyramidal cataract was likewise present. The child was discharged on April 5th, and he then weighed 11¾ pounds.

On February 13th, under chloroform, scrapings were taken from the left cornea and were handed over to Dr. W. A. Milligan, pathologist to the Hospital for examination. Dr. Milligan reported: "Film stained by Giemsa. There are to be seen delicate screw-like rods resembling the spirochæta pallida." The observation was repeated on the 21st. Similar results were obtained independently by myself.

20.—This patient was an infant, aged three months, in whom the syphilitic manifestations included athrepsia, coryza, slight enlargement of the spleen and liver, and a few small ulcerated papules about the anus. The corneæ were practically destroyed and the eyes were in a codition of incipient panophthalmitis when the baby was seen by me. The treponema pallidum was found in scrapings from the diseased corneæ. A microscopical field could seldom be examined without coming across one or more of the micro-organisms.

21.—Joseph Wood, aged 3 months, was admitted on July 11th, 1907, and died on the 28th.

The *family history* showed that three children were born dead, one at seven, one at eight, and one at nine months. The fourth baby, a girl, wasted from the first, and both eyes were affected, probably with ophthalmia neonatorum, on the fourth day. She died when four months old.

The *personal history* of the patient was as follows:—He was born "a fine baby," but had wasted since he was three weeks old. He had been subject to vomiting after his bottle for the previous three weeks. There had been no diarrhœa. It had been noticed by the mother that the boy's eyes had been inflamed for five days and that for two days "a white film" had formed over the left eye.

When admitted the child was wasted, cried continually, and "snuffled" loudly. His weight was 7½ lbs. and his temperature was 97.6°

F. There were ulcerated condylomata around the anus. The umbilicus showed a dry, ulcerated surface overlying a thickened mass, probably a gumma. The spleen and liver were palpable. The infant was jaundiced. There was a sanious watery discharge from both eyes, especially from the right. An examination under chloroform showed that the corneæ were surrounded by a glistening ring or xerosis, slightly wider at the inner and outer side than elsewhere. Again, the ocular conjunctiva was of characteristic silvery appearance, was dry, wrinkled, and could be readily pinched up. The right cornea was tolerably clear except for a purulent infiltration in its upper-inner quadrant. A large part of the left cornea was occupied by a purulent focus, made up of two divisions—a larger one below and to the inner side, and a smaller one to the outer side at a somewhat higher level. None of the cornea was clear. There was no swelling of the lids or other evidence of inflammatory reaction.

On July 18th the right cornea was occupied by a greyish-yellow slough and there was a bulging dark spot in the lower-outer quadrant representing a keratocele. The left cornea was in a similar but even more desperate condition. Evidences of inflammatory reaction were conspicuous by their absence. The navel had healed. The general condition of the child had not improved. He weighed 7¼ lbs. On the 26th the baby had developed a well-marked papular eruption of a dull-red colour over the body and limbs. The papules averaged one-eighth of an inch in diameter. He took food badly, "snuffled" and was getting weaker. He died from exhaustion on the 28th. No necropsy was held.

On July 12th Dr. Milligan reported staphylococcus pyogenes albus in a tube of agar-agar smeared with secretion from one cornea. On the 14th an examination of smears for the spirochæta pallida reported negative. On the 25th, however, staphylococcus albus on agar-agar and spirochætæ were found in smears treated by the Giemsa plan.

22.—Mapham, Frederick, 9 months. Admitted Kensington General Hospital on May 14th, 1907, and died May 24th, 1907.

History.—The child was suddenly taken ill on May 24th with blueness, fixation of the eyes and (?) convulsions. He then vomited several times.

On Admission.—A thin child, rather collapsed. T. 103° F. P. 160. Breathing rapid. A diagnosis of broncho-pneumonia at the left base was made.

Progress and treatment.—*May 16th,* 1907.—Discharge from eyes, ears and nose. *May 17th,* 1907.—Broncho-pneumonia right apex behind and also right base. *May 18th,* 1907.—Child examined for the first time by me. There was a good deal of muco-purulent discharge from the eyes, but no ulceration of the cornea. *May 22nd*, 1907.—The general condition of the child is serious. The eyelids are kept properly closed. Both corneæ have perforated, and the iris has prolapsed. In the right eye the perforation is in the lower third of the cornea, and in the left eye at the lower-inner quadrant. There is pus in the anterior chamber of the left eye. Signs of inflammatory reaction are slight. T. 190.8° F. P. 168. *May 23rd*, 1907.—T. (night) 106° F. Respirations, 76. Pulse scarcely countable. *May 24th*, 1907—Since the 22nd the child has been more or less unconscious, with semi-closed eyelids, but it is to be noted that prior to the date mentioned the lids were kept closed. T. 107° F. Child died at 4 o'clock p. m.

Bacteriological report.—On May 23rd, 1907—that is, the day before death—agar-agar and blood-serum tubes were inoculated from the material which covered the ulcer of the left cornea. The greater part of the growth on agar-agar was composed of staphylococcus albus and aureus. But intimately mixed with these in small number was a small and short bacillus, which resembled Hoffmann's bacillus, but which it was impossible to obtain in pure culture. On the blood-serum the proportions of the various colonies were different from those on the agar-agar, but the component micro-organisms were the same.

Post-mortem examination (made on May 25th, 1907).—The left pleura contained slightly blood-stained effusion and flaky lymph. Broncho-pneumonia at the left base. Exudation almost purulent. No breaking down. Small patches of broncho-pneumonia dotted through rest of lung. Right base earlier broncho-pneumonia. Small abcess about an eighth inch in diameter, in middle lobe. No caseation of bronchial glands. No evidence of meningitis. Abdominal viscera normal. Some milkiness in arachnoid around optic chiasma.

23.—Boyd, Elizabeth. 5 weeks. Admitted to Queen's Hospital for Children on June 3rd, 1907. Died June 5th, 1907.

President condition.—Weight, 5½ lbs. Temperature, 96° F. The left cornea is opaque and grey, but symptoms of inflammation, as redness, almost absent. The affected eyeball looked shrunken.

History.—The right eye has been noticed to be bad for a week. Four other children (three stillborn). Patient affected with extreme marasmus.

Treatment.—Physostigmine, grs. 2, three times a day. Boric cleansings. Mercury ointment, half a drachm, for inunction once a day. On the day of death (June 5th) 10 drops of brandy every two hours were prescribed.

Post-mortem examination.—Pneumonic consolidation of lower lobe left lung and of lower and middle lobes of right lung. Kidneys very pale. Other organs normal. No evidence either of tubercle or of syphilis.

24.—Grizzle, Florence E., aged 9 months. Admitted to the Evelina Hospital on July 7th, 1908, and discharged on July 21st, 1908.

History.—No family history of phthisis pulmonalis. The eyes stated to have been bad and to have "stuck in the morning" during the last ten days.

On admission.—This miserable wasted infant weighs 8 lbs. 14 ozs. Her temperature is 100° F. There are a few sores about her anus, together with evidences of a recent papular eruption, but the manifestations are not definitely syphilitic in type. The breath-sounds are rather faint at the base of the left lung, where tubular breathing can be heard. There is a discharge from both ears.

Eyes.—Externally, no marked signs of anything like serious inflammation of the deeper parts of the eye. The right cornea, however, is replaced by a greyish-white slough, through the upper temporal quadrant of which peeps a small protrusion of Descemet's membrane (keratocele). No xerosis conjunctivæ. No particular redness of eyeball. The left cornea is represented by a yellowish-white slough. Two dark-hued keratoceles are present—one at the inner and the other at the outer end of the horizontal meridian of the cornea. No xerosis of the conjunctiva.

Treatment and Progress.—Child fed on milk and barley. water (equal parts). Ten drops of brandy were given every four hours. Physostigmine sulphate drops (gr. 1 to the ounce) applied to each eye three times a day. The eyes were kept clean with hot saline lotion (1.4 per cent.).

July 10th, 1908.—Left eyeball not reddened, and cornea much as noted. *July 14th,* 1908.—Weight 8 lbs., 8 ozs. General condition worse. As regards eyes, reactional signs but slight. The lower third of the right cornea is sloughy, while its upper two-thirds are protuberant. There is keratectasia of the left cornea, especially affecting the upper and lower part of the latter. *July 21st,* 1908.—Has improved in general condition since last note, and child now weights 8 lbs .11 ozs. Discharged.

Child seen as an out-patient on *August 8th,* 1908, and found to be decidedly better in her general health. She had four teeth. There was globular keratectasia of the right cornea, while the left eyeball was shrunken.

Bacteriological examination.—On admission, scrapings were taken from the left cornea (which was in a pultaceous state) and smeared upon the surface of several cover-slips, which were then stained with methylene blue and with Gram and eosin. Numerous micro-organisms were present. There were cocci, diplococci, and short chains in the various specimens examined. Clearly, most of them were pneumococci, as shown by the lanceolate shape of the diplococci, the well-marked capsulation, and by the fact that they stained deeply with Gram. On agar and blood-serum a coccus was isolated, which appeared to be the pneumococcus, and after a longer stay in the incubator, aspergillus fumigatus developed. At a later period cultures were made from the right eye, and on this occasion the xerosis bacillus, along with a coccus, was obtained. The coccus was a streptobacillus growing in short chains, and Gram-postive. Broth is rendered turbid in twenty-four hours. Litmus milk is turned acid and firmly coagulated in forty-eight hours. On agar there is a much greater tendency for the colonies to become confluent than is seen in streptococcus longus. The cocci grow well on gelatine at a temperature of 20° C., without producing any liquifaction of the medium. Glucose salicin and lactose were fermented, with the production of acid but not of gas. Mannite was unchanged.

25.—Turner, Caroline, 1 year and 8 months. Admitted to Queen's Hospital on September 10th, 1908, and discharged October 14th, 1908.

Admitted for xerosis conjunctivæ and potential keratomalacia.

Family history.—Four other children all well. The mother suffers from "bronchitis" and is very short of breath, and her voice is hoarse. No specific history could be elicited.

Personal history.—Bronchitis when aged one year. The child has been ill for one week—will not take her food, is always crying, is wasting, and her bowels are irregular. The eyes have been noticed to discharge for one week.

On admission.—A flabby, wasted child, with wrinkled and inelastic skin. Complexion sallow and muddy. General condition apathetic; does not resent examination or interference in any way. Eyes sunken. The still open anterior fontanelle is depressed. Head bossy, square, and very large. Forehead overhangs face. Moist sounds at base of both lungs. Edges of eyelids sore, especially at the outer canthi, where the scally condition characteristic of diplobacillary infection is present. No marked redness of eyes, photophobia, or lacrymation. Ocular conjunctiva all around corneal margin and over a triangular area on either side of the cornea in both eyes is sticky, wrinkled, and devoid of its normal glistening appearance. Both corneæ are dull, especially in the lower part of the outer quadrants. The opacity is slight and apparently superficial, and due to changes in the epithelium. When fluorescein is dropped into the eyes, the nasal side of the right cornea stains readily, while there is only a slight diffuse hazy staining over the centre and lower half of the left cornea. There is a slight sticky discharge in both conjunctival sacs.

Progress.—September 26th, 1908.—Child very much better. She is much more lively. Both corneæ are clear, and the conjunctiva is now practically free from xerotic changes. *October 14th*, 1908.—Conjunctiva and corneæ now free from morbid changes.

Successive weights were 14½ lbs.; 15 lbs.; 15½ lbs.; 28 lbs.

Bacteriological Examination.—Diplobacilli (Morax-Axenfeld) in smears from conjunctival sac and in cultures on blood-agar.

26.—Reredon, Bertha, eight months. First attendance as an outpatient at the Queen's Hospital for Children, September 23rd, 1909. Admitted to Hospital on October 7th, 1909, and discharged on January 25th, 1910.

When seen in the out-patient department this child appeared to be suffering from acute infective conjunctivitis of the Koch-Weeks' type, and very slight dulness of the left cornea. The cause of the dulness of the cornea was not apparent to me. Ordinary treatment was prescribed.

The history of the case was that the baby had suffered from whooping cough 3½ months ago and from measles 3 weeks ago. The whooping cough was followed by bronchitis which lasted for about a month. The child's eye was said to have become bad after the whooping cough and bronchitis, and to have got worse since the measles. Patient is the youngest of eight children.

Patient again attended out-patient department on September 30th, but no note was made by the R. M. O. who saw the case.

On *October 7th*, she again attended, and I examined the condition myself. The left cornea was then sloughing and presented a keratocele towards its center. The condition of the eye was most serious. The child was accordingly admitted to Mary Ward. She was in an extremely septic state, and her vitality was very low.

October 14th, 1909.—Left cornea has perforated towards the inner end of the horizontal meridian and a flesh-coloured granuloma, which probably arises from the iris, plugs the perforation in the cornea. The right eye shows less discharge. Case has been treated with physostigmine.

October 21st, 1909.—General condition of the child better than a week ago. Less conjunctival injection. Prolapse of iris not increased in size.

October 25th, 1909.—State of left cornea, as well as general condition of child, continues to improve.

October 28th, 1909.—Left cornea the seat of a leucoma adherens. No clear and unaffected tissue.

Bacteriology.—In scrapings from cornea were found: (1) pneumococci; and (2) m. catarrhalis.

Treatment.—Hot saline often, physostigmine (grs. 2) t. d. Eye bandaged. Brandy, 10 m., every four hours.

February 10th, 1910 (seen as an out-patient). The left cornea is staphylomatous. The eyeball is of a dusky-red colour. Tension low.

27.—Langley, Ellen, 10 months. Admitted Queen's Hospital for Children on September 28th, 1909, and died October 8th, 1909. O. P. number, 3784.

This was a case of "zymotic diarrhœa," the temperature being a good deal raised practically during the whole time she was in Hospital.

The child was under the care of my colleague, Dr. Sheffield Neave, and on her first attendance as an out-patient the following notes were made under date September 21st, 1909:—

"Diarrhœa 4 days. Retches, but brings nothing up. Breast-fed every two hours. Bowels open every time has breast. Green, watery, and offensive motions. Prolapse. Skin inelastic. No teeth. Fontanelle very patent. Eyes sunken."

When attending the Hospital as an out-patient, the left eye became affected, then she was admitted to the ophthalmic ward on September 28th, 1909.

On admission.—A wasted child. The left eye shows a sloughing ulcer, which involves, roughly, the lower third of the cornea.

Death on October 8th, 1909. No autopsy.

28.—Knell, Alfred, 6 months. Admitted to the Evelina Hospital under Dr. T. R. C. Whipham on September 2nd, 1909.

Family history.—Eleven children in family, six of whom are dead, one from "wasting." One miscarriage at the third month.

Personal history.—Full time after normal labour. Breast-fed. No other ailments. Diarrhœa for a fortnight, and getting thinner since then. Mother says child has had considerable abdominal pain. Sleeps badly, and cries a great deal.

On admission.—A fairly nourished child. Eyes not sunken, and expression almost animated. Skin inelastic. Lies comfortably in bed, but keeps legs drawn up. Cries when abdomen is touched. No physical signs of disease in chest. Spleen enlarged.

Treatment and Progress.—*October 15th*, 1909.—A week ago two large red swellings appeared on the scalp. These soon burst and discharged a considerable amount of pus. Bare bone was seen at the bottom of the cavities. The temperature rose with the abscesses, but gradually fell when they evacuated themselves.

October 19th, 1909.—Something amiss noticed with the right eye.

October 23rd, 1909.—Patient examined by me for the first time. No redness or swelling of the lids. R. E.—no redness or blepharospasm. The centre of the cornea is occupied by a keratocele, to which the iris is not adherent. Rest of cornea shows no obvious changes. Child very placid, resenting but little attempts to examine the eye. General condition of child miserable. An atypical case of keratomalacia. Physostigmine sulphate, gr. 1, t. d. Bandage. Eye to be kept clean with saline, 1.4 per cent.

Bacteriological Report.—Scrapings from keratocele, or rather from the small slough which was attached to its anterior surface, smeared on cover-glasses and inoculated into agar (old and more or less dry). In the smears organisms that appeared to be pneumococci. On the agar, sarcinæ and s. p. albus (Leathem).

November 2nd, 1909.—Both the general and the ocular condition considerably bettered. R. E.—No redness. Opens eye freely. Keratocele is now replaced by a shield-shaped leucoma, to which the iris is non-adherent, which covers practically the entire pupillary area of the cornea. L. E.—has never been affected.

Remarks.—Baby believed to be syphilitic on account of family history and abscesses in scalp. He also suffered from diarrhœa and vomiting, and when eye got involved, was a pretty miserable specimen. Eye improved along with general health. Diagnosis on admission—"wasting." Mercury with chalk, gr. 1, t. d., commenced on September 12th, and increased to grs. 3, t. d. on the 15th.

29.—Barton, Gladys, 11 months. Admitted July 13th, 1909, and discharged October 11th, 1909.

History.—Both eyes have been "discharging" for about three weeks. They have been red and slightly swollen for a few days. On the 12th instant the mother observed a curious black speck in the left eye, and on that account took the baby to Moorfields. The child was referred to the Queen's Hospital from Moorfields as supposed to be suffering from diarrhœa and vomiting.

On admission.—Slight discharge from both eyes. Slight photophobia. No redness. There is a perforation in the lower-inner quadrant of the left cornea, with prolapse of the iris through the aperture. The remainder of the cornea is clear.

Progress and Treatment.—*July 17th,* 1909.—A gutter-shaped ulcer has suddenly appeared in the lower half of the right cornea. It is of some considerable depth, but is not infiltrated. There is no redness of the eye. The rest of the cornea is slightly hazy. *July 18th,* 1909.—Now some redness of both eyes. The ocular conjunctiva lies in folds. The gutter-shaped ulcer is spreading along the lower fourth of the right cornea, and is associated with a yellowish flaky deposit of pus in the anterior chamber. *July 22nd,* 1909.—R. E.—The condition bears a closer resemblance to ulcus serpens in the adult than anything I have ever seen in a child before. Thus, the lower fourth of the cornea is occupied by a trench-like ulcer, of which the lower edge is rounded off, while the upper one is overhung with epithelium and is purulent. The remainder of the cornea is slightly hazy, probably from chemotaxis. L. E.—A leucoma adherens is present in the lower part of the cornea. The aggressive edge of the ulcer of the right cornea was treated with the galvano-cautery. *July 24th,* 1909.—The ulcer of the right cornea has perforated towards its outer end, and the iris has prolapsed into the aperture. Hypopyon has disappeared. Pupil drawn towards perforation. Rest of cornea clear. There is still some inflammatory redness and ciliary injection. *July 26th,* 1909.—Protrusion of iris greater in the right than in the left eye. Child very constipated. Her urine is thick, offensive, and contains pus. *July 31st,* 1909.—Child much better. Bowels open, and urine almost clear and not so offensive. The eyes show no redness. Each cornea is now clear and exhibits only a semi-transparent adherent leucoma in the positions already mentioned.

An iridectomy was performed upon each eye in August and September, 1909, and the child was discharged, apparently seeing well, on October 11th, 1909.

The treatment included argyrol (15 per cent), physostigmine (gr. 1 to the ounce), iodoform, oxycyanide lotion (1:5000), and saline lotion (1.4 per cent).

Bacteriological examination.—On July 22nd, 1909, material taken from beneath the ledge of epithelium in the right cornea, was smeared upon the surface of several cover-glasses. These, when stained, showed many tiny cocci and diplococci, some of which were capsulated. The micro-organisms were Gram-positive. It was almost certainly the diplococcus lanceolatus (pneumococcus). No culture, however, was obtained upon agar-agar or blood-serum.

30.—Shackleton, Beatrice, six weeks. Admitted to the Queen's Hospital on August 15th, 1910.

History.—The fourth child, born at term after a natural labour in Queen's Charlotte's Hospital, London, on July 7th, 1910. No miscarriages. Weight, 6 lbs. 3¼ ozs. At birth no discharge was noticed from the baby's eyes, but the left eye began to discharge on the eighth and the right eye on the twenty-second day after birth. The symptoms of inflammation were not marked, and gonococci could not be found in secretion from the eyes. There was a return of conjunctivitis, of a very trivial nature, and on August 12th, when I first examined the patient, the right cornea showed a trench-like ulcer in its lower third. There was a little muco-purulent discharge from the eyes, but symptoms of actual inflammation on the part of the conjunctiva were almost non-existent. At the same time micro-organisms that appeared to be gonococci were found in cover-slips smeared with conjunctival secretion (see bacteriological report). The aspect of the case, taken in conjunction with the withered appearance of the baby, was more suggestive of keratomalacia than of gonorrhœal ophthalmia with corneal complications.

On admission.—Weight, 7 lbs. 13 ozs. The trunk is well-covered, but the arms and legs, more especially the latter, are inclined to be wasted. Temperature 99.4° F. Baby takes food well and has a strong cry. Heart, lungs and abdomen normal. The eyelids are slightly red and swollen. There is dicharge from the eyes. The conjunctiva is slightly reddened. Both corneæ are affected. The right cornea has perforated in its lower third, and the perforation is occupied by a small prolapse of the iris. A glistening ring of xerosis encircles the lower third of the limbus. The lower half of the left cornea is occupied by a large infiltrated ulcer.

Treatment and Progress.—Physostigmine and hot saline to eyes, together with disinfection twice a day with "perhydrol." *August* 18*th*, 1910.—The signs of conjunctivitis are not pronounced, and are certainly nothing like those present in an ordinary case of ophthalmia neonatorum (gonococcal). The lower third of the right cornea shows a large prolapse of the iris, which is surrounded by a zone of infiltrated cornea. The lower two-thirds of the left cornea is occupied by a septic ulcer, the floor of which is of unequal depth. Annular xerosis of right eye, as noted. *August* 19*th*, 1910.—Weight, 8 lbs. 2 ozs. *August* 23*rd*, 1910.—Discharge from eyes less. The right cornea much in same condition as already noted. The left cornea, however, shows signs of impending perforation. *August* 24*th*, 1910.—Prolapse of iris in left eye. *August* 25*th*, 1910.—Eyes examined under chloroform. The right cornea shows a cicatrised perforation in its lower third to which iris is totally adherent. The left cornea has also perforated and is in process of healing. Hardly any symptoms of conjunctivitis are present. General condition has improved. Weight, 8 lbs. 8 ozs. No diarrhœa (stools 2 to 3 daily). No broncho-pneumonia. *September 1st*, 1910.—Baby in good condition, weighing 9 lbs. She opens her eyes, which present no obvious signs of inflammation. Both corneæ have now healed with the production of an adherent leucoma. The prolapsed iris noted as present in the right cornea on August 18th has leveled down. No xerosis.

Bacteriological Report.—1. *Specimens taken whilst baby was an inmate of Queen Charlotte's Hospital (from conjunctiva).*—Films show Gram-negative intra- and extra-cellular diplococci in fairly large numbers, resembling the gonococcus in shape and size. The stain with Pappenheim is characteristic of the same organism. On blood agar, cultures were obtained of a Gram-negative diplococcus. The cultures, which were pure, were those of a slowly-growing but typical gonococcus. 2. *Specimens taken direct from the cornea on August 15th, 1910, after admission to the Queen's Hospital.* Report by Dr. A. W. G. Woodforde, pathologist to the Hospital.—Films show the same organism as that found at Queen Charlotte's Hospital, but in smaller numbers. On agar a few colonies were obtained of a large Gram-positive bacillus. On blood-agar, there were a few colonies of the same Gram-positive bacillus, and also of a Gram-negative diplococcus, showing numerous giant forms. The latter colonies were typical of gonococci. The Gram-negative diplococcus was transplanted on ordinary agar, where it grew feebly. A second subculture showed no growth at all.

31.—Carslake, Rose, 8 months. Attended Evelina Hospital for first time on November 2nd, 1909.

Diagnosis.—Keratomalacia (B. E.)

History.—Third child. Always bottle-fed. Lately, the mixture has consisted of equal parts of boiled milk and barley water.

Three weeks ago child was attacked by bronchitis, and was attended by a dispensary doctor. On October 26th last the baby's eyes were noticed to be bloodshot and to discharge yellow matter. Lotion was prescribed by the medical man in attendance upon the case. This morning (November 2nd) condition of eyes such that the child was sent straightway to the Hospital.

Present state.—The baby looks ill, moans feebly, and is somewhat wasted. The eyes can be half opened. The lids are perhaps a trifle reddened, and may be a little œdematous. There is a certain amount of muco-purulent discharge from the conjunctiva, which nevertheless is not markedly injected. R. E.—The cornea is surrounded by a slightly raised, narrow, white line of xerosis, but the ocular conjunctiva shows no such change. The lower third of the cornea is occupied by a purulent ulcer which has perforated, and allowed the iris to prolapse. L. E.—The lower-inner quadrant of the cornea is the seat of a purulent ulceration, and the adjacent parts of the limbus show a semi-circular line of xerosis, similar to that described as present in the case of the right eye.

The baby was sent to Queen's Hospital for admission under my care. She remained in that institution from November 2nd, 1909, until January 31st, 1910.

Treatment and Progress.—Upon admission, the child was placed upon a suitable milk diet, hot boric fomentations were applied to the lids, and physostigmine (grs. 2 to the ounce) was dropped into the eye three times a day. Brandy was given. *November 3rd*, 1909.—No discharge from eyes. Slight photophobia. Eyelids were slightly swollen. Trivial injection of eyeballs. Situated along the inner and outer edge of each cornea is a thin, white, elevated line, like the crest of a wave. The right cornea is generally hazy, and a perforated purulent ulcer lies in the lower nasal quadrant of the cornea. As regards the left cornea, a shallow purulent ulcer, of kidney-bean shape, lies below the pupil in the lower nasal quadrant of the cornea. The eyes can be examined without any particular resistance on the part of the child, who is ill-nourished and weakly. *November 7th*, 1909.—Xerosis is present of both eyes at the inner and outer side of each cornea. The right cornea is prominent, and the eye injected. The ulcer of the left eye is somewhat larger, and hypopyon is present. *November 10th*, 1909.—There is now marked congestion of each eyeball. The hypopyon noted as being present in the anterior chamber of the left eye is rather less profuse. *November 18th*, 1909.—R. E.—Five-sixths of the cornea is now covered with a greyish-yellow slough, probably in connection with the prolapsed iris. L. E.—Pupil well contracted by physostigmine. An extensive but shallow ulcer occupies the lower-inner quadrant of the cornea. Condition of baby grave. Since the 12th instant the temperature has ranged from 100° F. to 103° F., and has touched normal only on two occasions, although taken three times a day; there have been from four to nine stools a day; the respirations have varied from thirty to sixty, and the pulse from 120 to 72 per minute. *November 25th*, 1909.—The ulcer of the left cornea has practically healed. *December 16th*, 1909.—The baby is now well on the way to general recovery. She has gained five ounces during the last two weeks. The right eye is shrunken, a little clear cornea only remaining. The left eye shows an adherent leucoma in the lower nasal cornea of the cornea. No redness of eye. Baby opens eye of own accord, and is stated to recognise her bottle at a distance of about a yard. *January 13th*, 1910.—Under chloroform, iridectomy performed inwards upon the left eye, a considerable piece of the iris being got away. *January 25th*, 1910.—Left eye in excellent condition, and results of operation satisfactory.

Whilst in Hospital successive weights were:—10 lbs. 14 ozs.; 10 lbs. 7 ozs.; 10 lbs. 14 ozs.; 10 lbs. 12 ozs.; and 11 lbs. 14 ozs.

Result.—This child was seen in the out-patient department on February 3rd, 1910, when her condition was as under: weight, 200 ozs.; general condition, fair. R. E. shrunken. L. E. leucoma adherens, with good iridectomy coloboma up and in.

Bacteriological Report.—Cover-glasses smeared with material from the ulcerated cornea were submitted to the Hospital pathologist, who reported that gonococci and xerosis bacilli were present. Apparently, however, no cultures were made or attempted.

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LANTERN DEMONSTRATION OF THE UNMODIFIED SMITH OPERATION FOR CATARACT.

DERRICK T. VAIL, M. D.
CINCINNATI, O.

Through the kindness of my friend, Dr. Greene, of Dayton, Ohio, I was given an opportunity of accompanying him on a visit to Major Smith at Jullundur, India, where I worked between September 27 and November 10, 1909. Dr. Clark, of Columbus, was also there. This paper is a brief report of Smith's operation for cataract as done by Smith himself.

I was given a rare opportunity to study and observe every point and detail of technic Smith employs in his cataract operation. I made copious notes while standing at the side of the operating table during ninety-nine actual operations, jotting down every minute detail from start to finish. I played the role of assistant in over fifty other operations until I learned all the points; I then did three hundred and fifty operations of my own account, keeping careful record. I also observed Smith and others do upwards of six hundred more and I made many sketches from poses kindly granted by Smith himself, Noor Ali, his favorite assistant, and the native patient. To give you a full report on this occasion of all that I observed and jotted down would be impossible, for it would consume hours of your time. I can only show you some of my many sketches, and a few photographs, the latter taken since my return, which, though the work of an amateur and hastily done, are accurate, illustrative and perhaps interesting because they were taken "on the spot." Col. Smith has seen them all and approved of them. I cannot show all I made for want of time. The full set will appear in Smith's book on "The Cataract Operation."

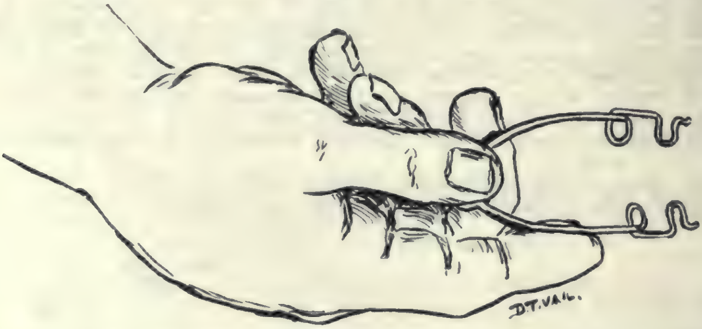

Fig. 1.—This illustrates the Jullundur speculum and the manner Smith handles it. The speculum has a light spring and no catch or fixation screw. The advantage of this method of handling the speculum is that it is under perfect control and can be removed with one hand as quickly as a flash, which is sometimes worth knowing.

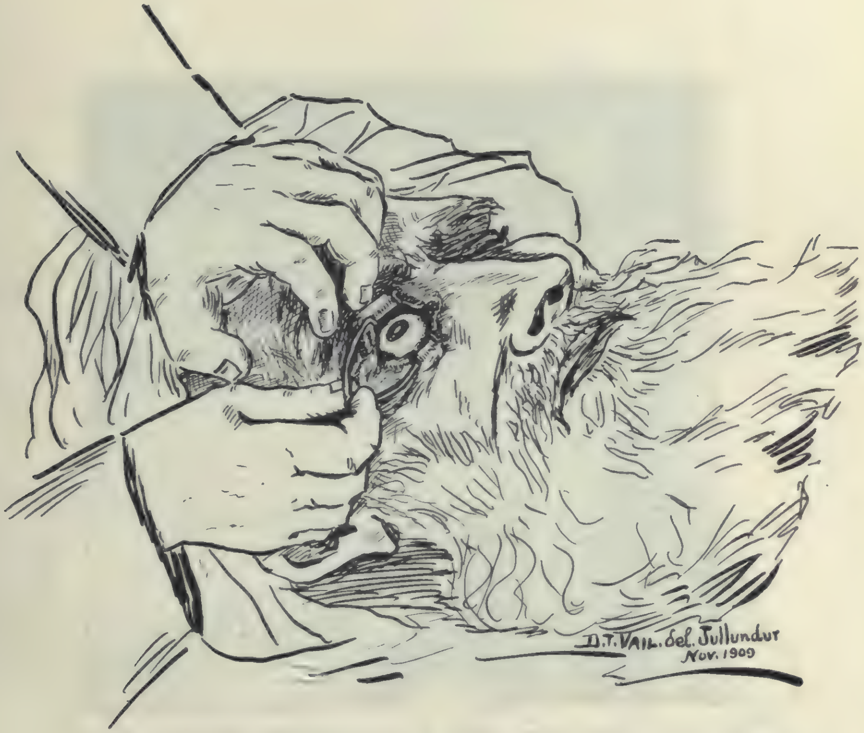

Fig. 2.—Preparing the eye for douching. The assistant grasps the speculum at its joint and lifts the eyelids away from the ball, while the fingers of his left hand forcibly retract the brow, thus obliterating all the rugae of the upper fornix to allow effective douching of the conjunctival sac in its entirety. This is done by means of a 1/2 inch stream of 1/2000 bichloride with a 3 foot drop. No swabs or sponges are used.

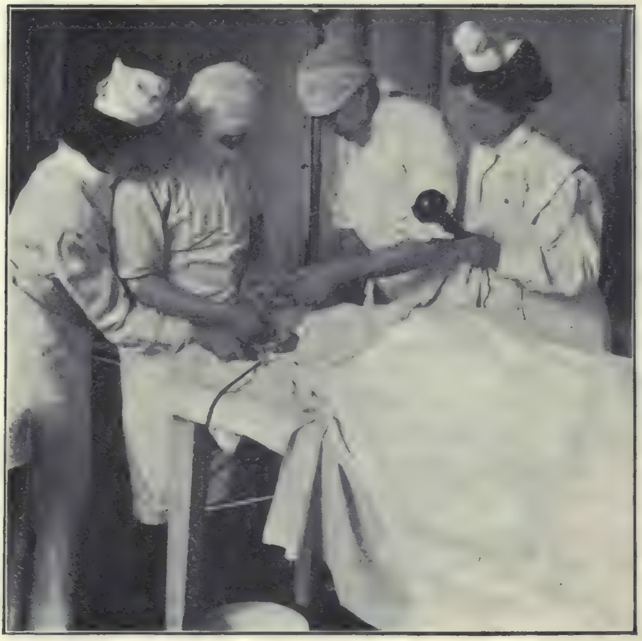

Fig. 3.—A group scene, taken in my operating room since my return, posing to illustrate the Jullundur method of flushing the conjunctival sac prior to all cutting operations on the eyeball.

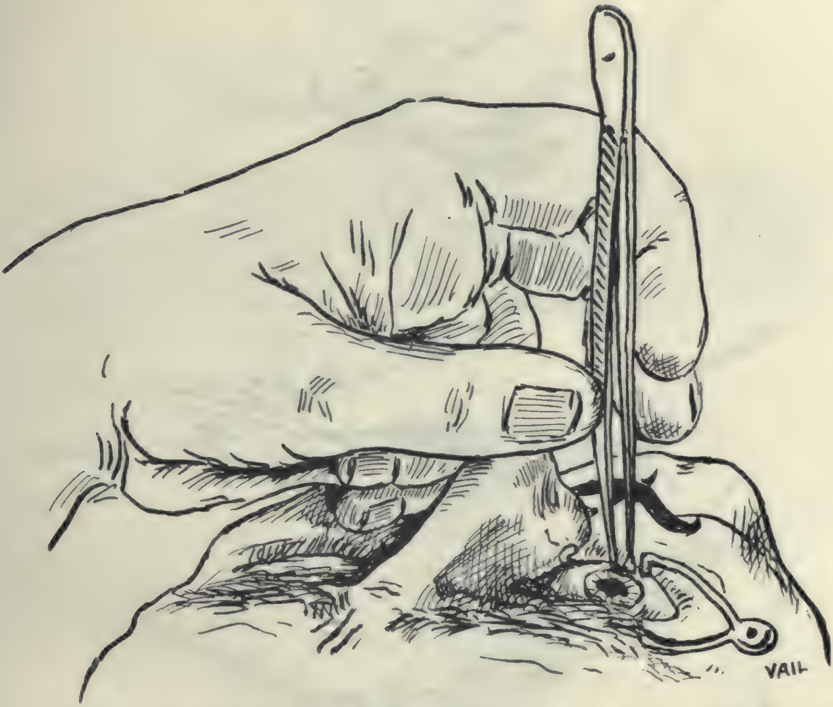

Fig. 4.—Showing the operator's left hand in the act of grasping the conjunctiva below the cornea prior to section, while steadying his hand on the side of the patient's nose and incidentally steadying the patient's face. At this stage the assistant applies the thumb of his right hand to the eyebrow to keep it under control during the section about to be made.

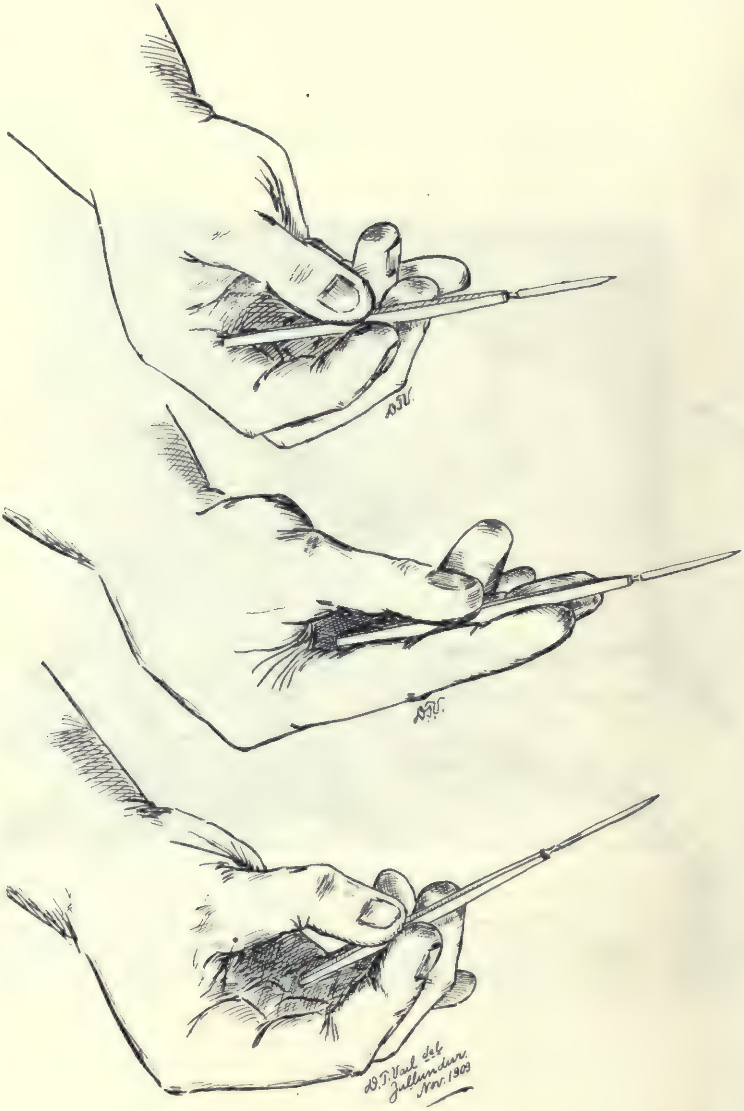

Fig. 5.—Showing a sketch of Smith's right hand holding the knife for sectioning the right eye during three stages of the section. (1) the point entering the limbus at the horizontal meridian, (2) fingers straightened out when section is half finished, (3) completing the section by finger movement, allowing the end of the handle to disappear deep in the hollow of his hand.

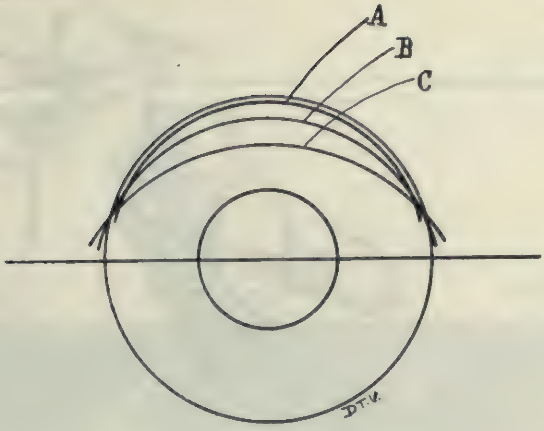

Fig. 6.—Showing three lines of section Smith employs; (a) rarely, (b) commonly, (c) occasionally. He prefers a knife that has been resharpened several times, until the blade is very thin, short and narrow. Weiss, of London, resharpens them and those that are sent back marked "dangerous" he likes best. He always turns the edge away from the iris at an angle of 15 to 30° and makes the cut with one forward stroke, lowering the handle, and occasionally a slow return stroke, raising the handle—cutting entirely in the cornea—no flaps. Smith's section is a little larger than the ordinary one and the cut is as nearly at right angles to the cornea as possible.

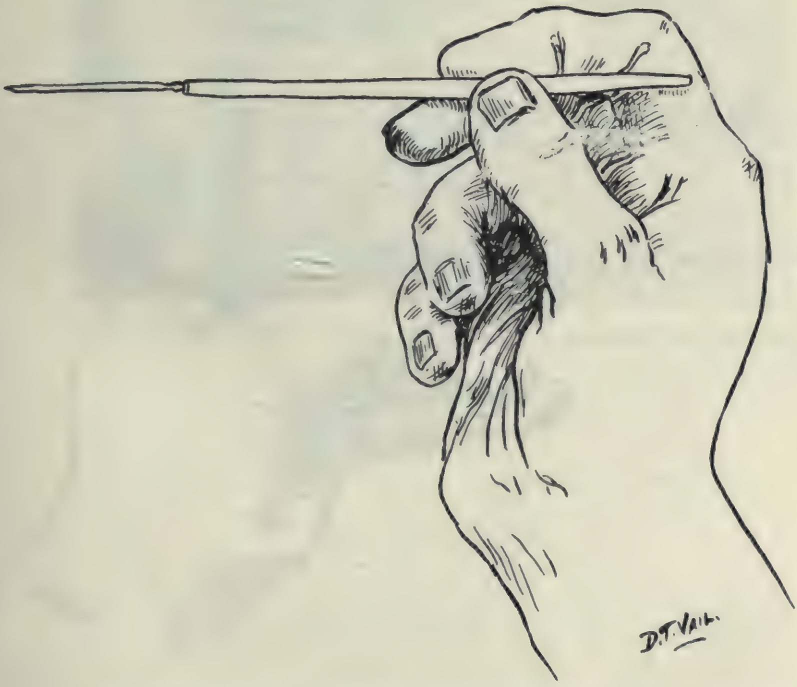

Fig. 7.—Showing first position in holding the knife for sectioning the cornea of the left eye, edge up, cutting away from himself.

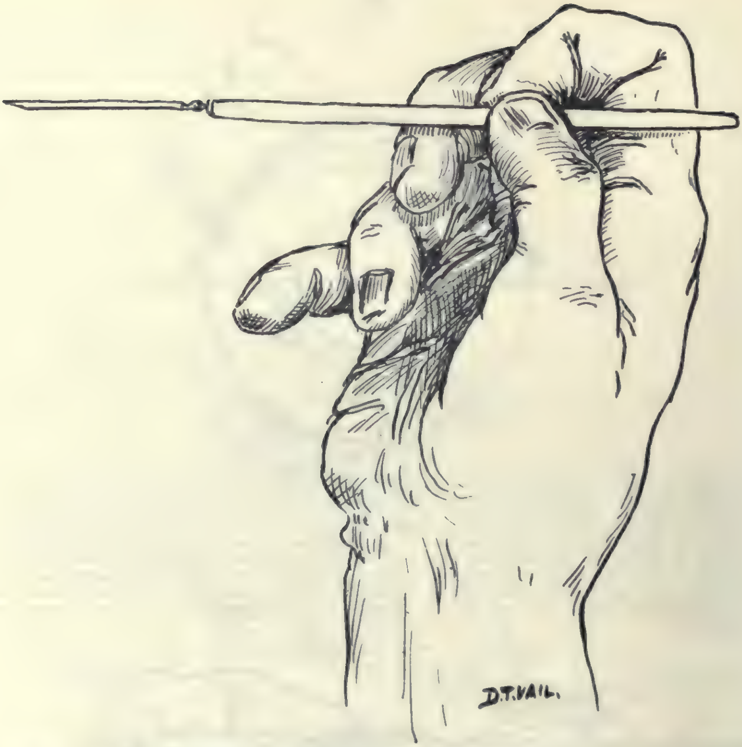

Fig. 8.—Second position of the knife for sectioning the left eye. The fingers are drawn back to their limit. The point is applied to the limbus and the knife held very loosely.

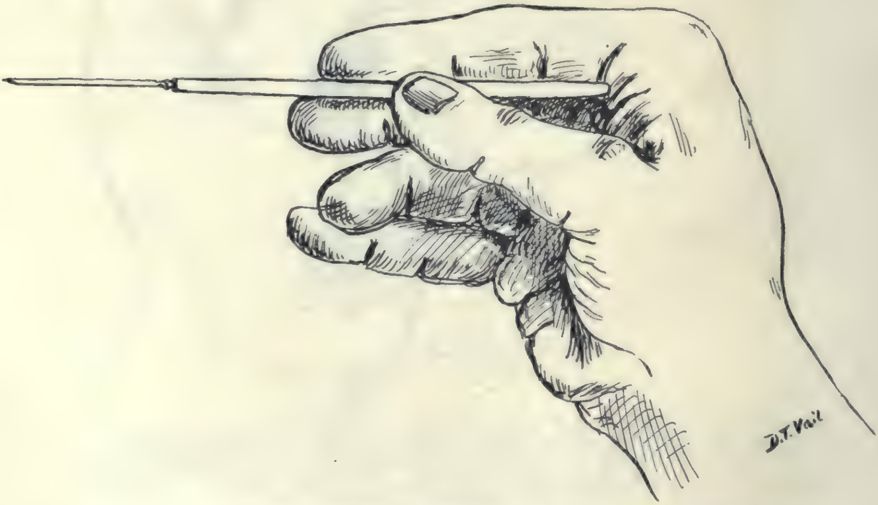

Fig. 9.—The third position when section is half finished with fingers straightened out. No arm movement is made; the entire section on right or left eye is done with finger movement.

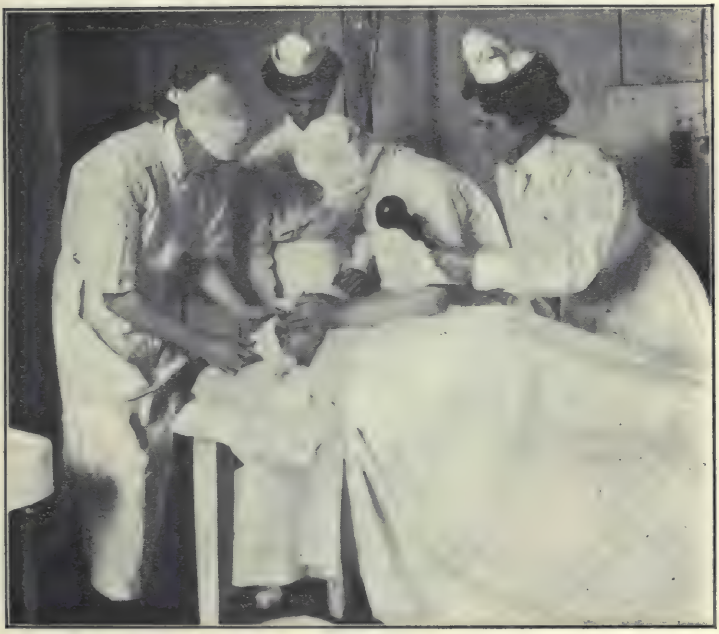

Fig. 10.—Group photo, showing the pose while sectioning the left eye.

We now come to the iridectomy as Smith does it. The assistant grasps the conjunctiva at the same place the operator had hold of it in making the section and he slowly rotates the eyeball downward.

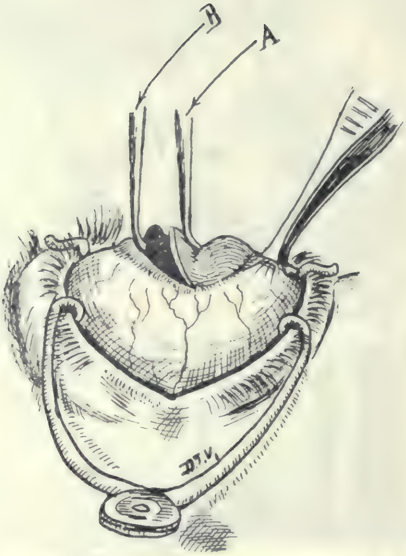

Fig. 11.—Shows one jaw of the iris forceps just within scleral side of the wound, while the other jaw is depressing the cornea and causing the iris to bulge upwards in the wound; as it does this, the jaws are closed to grasp the iris lightly and the forceps turned a little to favor the scissors. The forceps are held vertically to the eyeball.

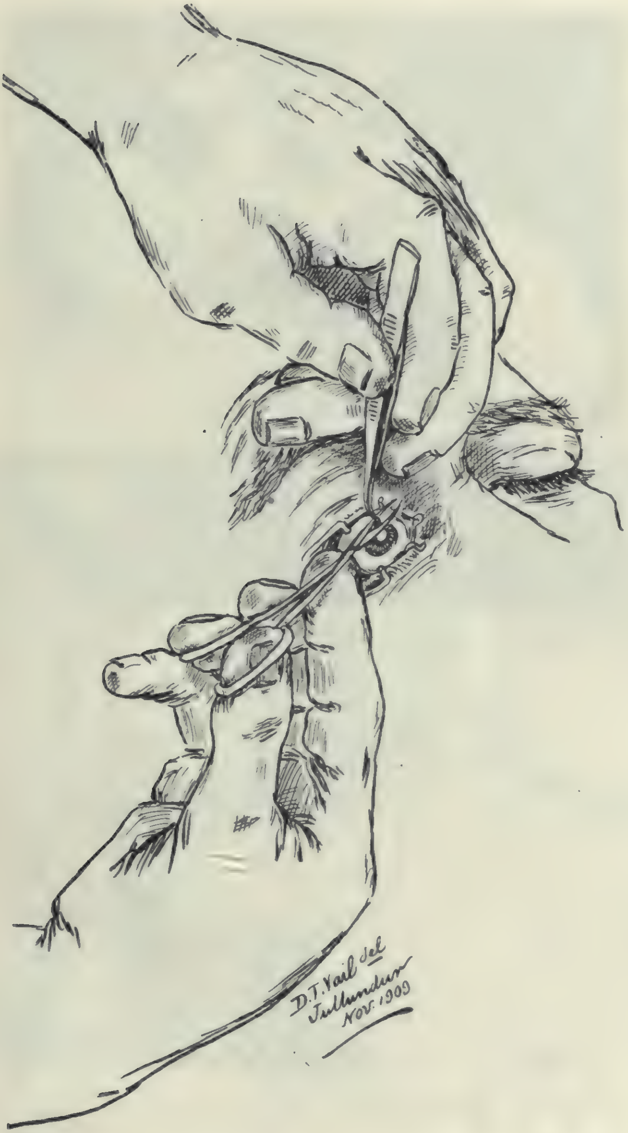

Fig. 12.—Shows the position of Smith's hands in the act of cutting the iris. Notice how the last two fingers of the left hand are firmly applied to the brow to keep it under control; also his method of holding the scissors in the right hand, palm upward like cup, and the rings of the scissors barely in the grasp of the tip of the thumb and ring finger, the forefinger steadying the scissors at the joint. The cutting is slowly done near the joint of the scissors, not at the point.

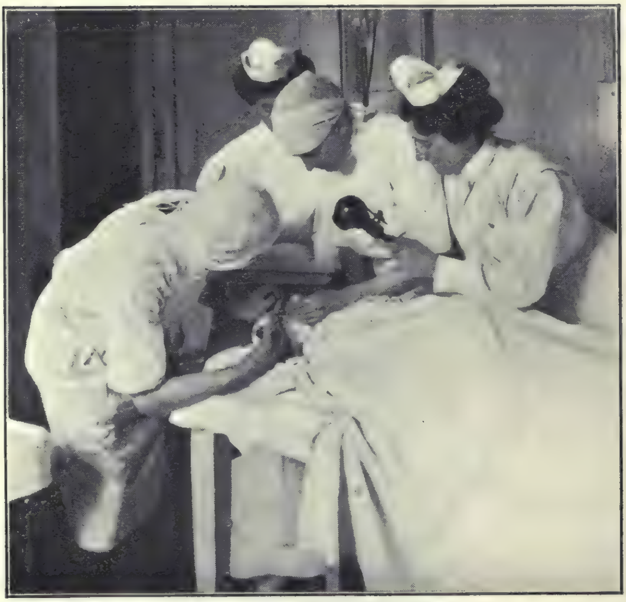

Fig. 13.—Showing a group scene to illustrate Smith's method of doing the iridectomy.

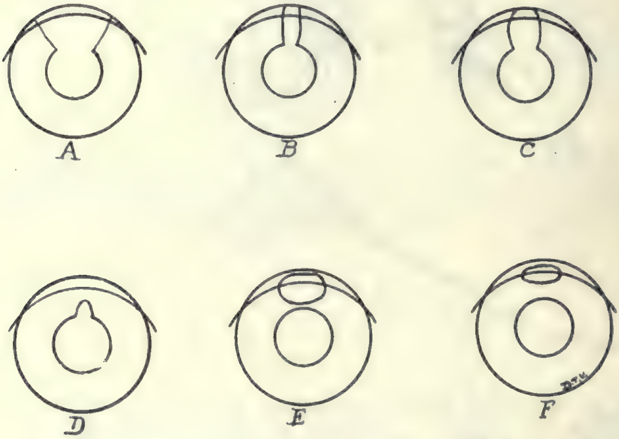

Fig. 14.—Showing different kinds of iridectomy; (a) too wide, (b) too narrow, (c) correct, (d e & f) "flukes," which will not deter him from going ahead and delivering without attempting to correct.

The speculum is now removed from the eye, reversing the movements made in introducing it, and the conjunctival sac "stripped" of tears and aqueous by means of the thumb or finger passing slowly over the closed lids from inner to outer canthus with slight pressure. The assistant now inserts the lid hook. After the iridectomy is completed and until the operation is finished, the upper lid is held away from the eyeball by a large sized strabismus hook in the hands of his assistant. I will first show the wrong way of doing this and then the right way.

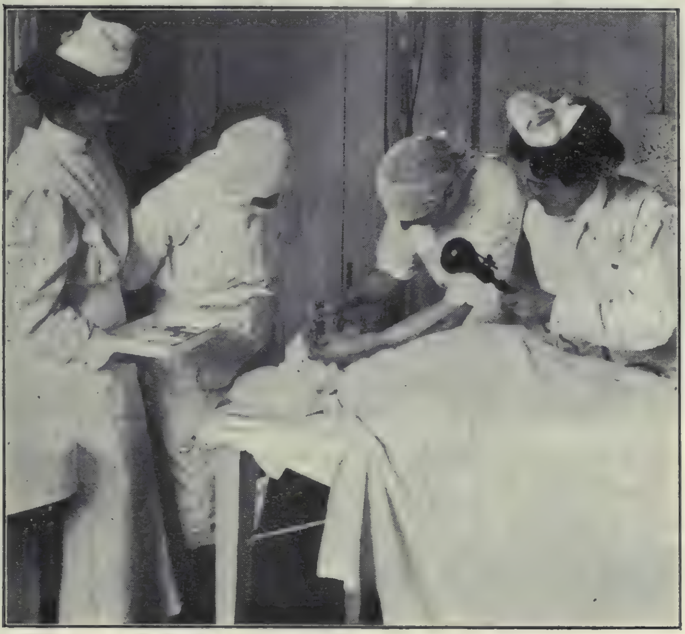

Fig. 15.—Shows the wrong way. The assistant's right forearm is too low; there is not room enough for the operator to get his left hand under the assistant's arm.

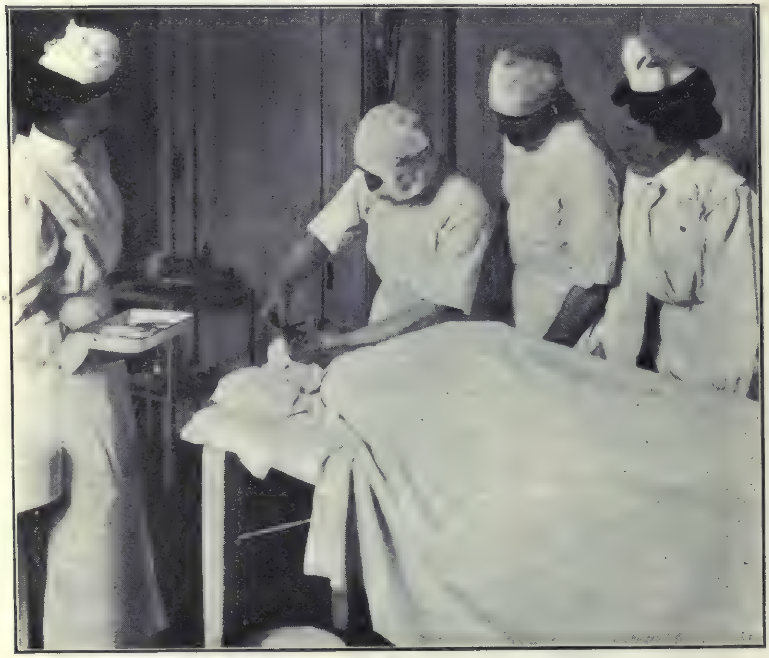

Fig. 16.—Shows the proper way for the assistant to approach the eye with the lid hook. The hook is about to be inserted at the outer canthus. The nails of the last two fingers are applied to the patient's brow to keep it under control and prevent squeezing. The hook is held at and below the junction of the shaft with the handle. The thumb nail faces the patient's feet and the elbow is high up to allow plenty of room for the operator to get at the field of operation with his left hand, which holds the emergency spoon.

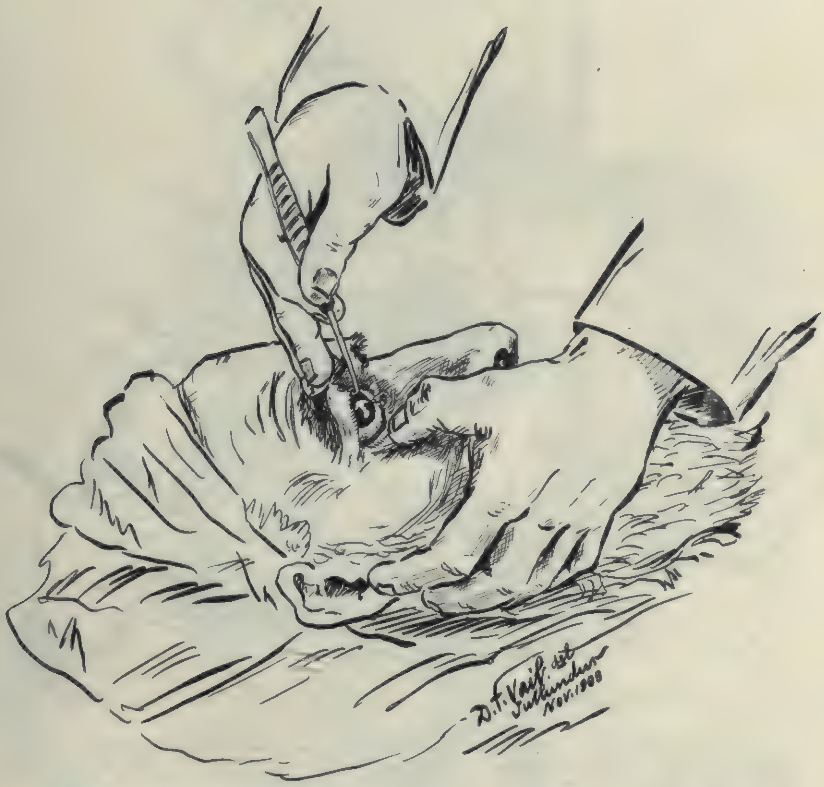

Fig. 17.—Sketched at Jullundur, Noor Ali posing. Notice the straight position of all the fingers of the right hand, the hook being held between the thumb and index finger and elbow high. Notice too that the thumb of the left hand is flexed in depressing the lower lid, while the palm of the left hand and the fingers are grasping the cheek and jaw to steady the patient's head. This patient will not squeeze or shake his head, as he is "fouled" by the assistant. Notice that the handle of the instrument is directed a little toward the crown of the patient's head.

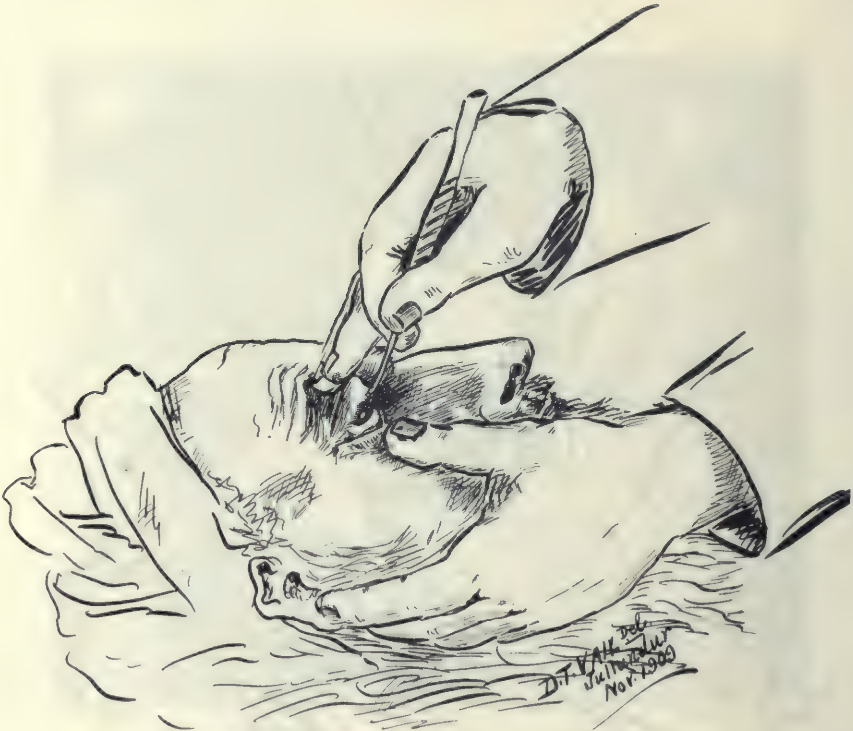

Fig. 18.—This is a companion sketch to the last, showing what the assistant does (without being told) just as soon as there is the slightest indication that vitreous escape is imminent. The handle of the lid hook is deflected toward the patient's feet while the end of the hook is made to still further raise the tissues of the cul-de-sac, thus taking every vestige of weight off the ball and favoring the return of vitreous to its bed. The thumb of the left hand which is retracting the lower lid ad maximum is now straight to allow room for the operator to see up under the upper lid, thus not narrowing the size of the field in spite of the new position of the upper lid.

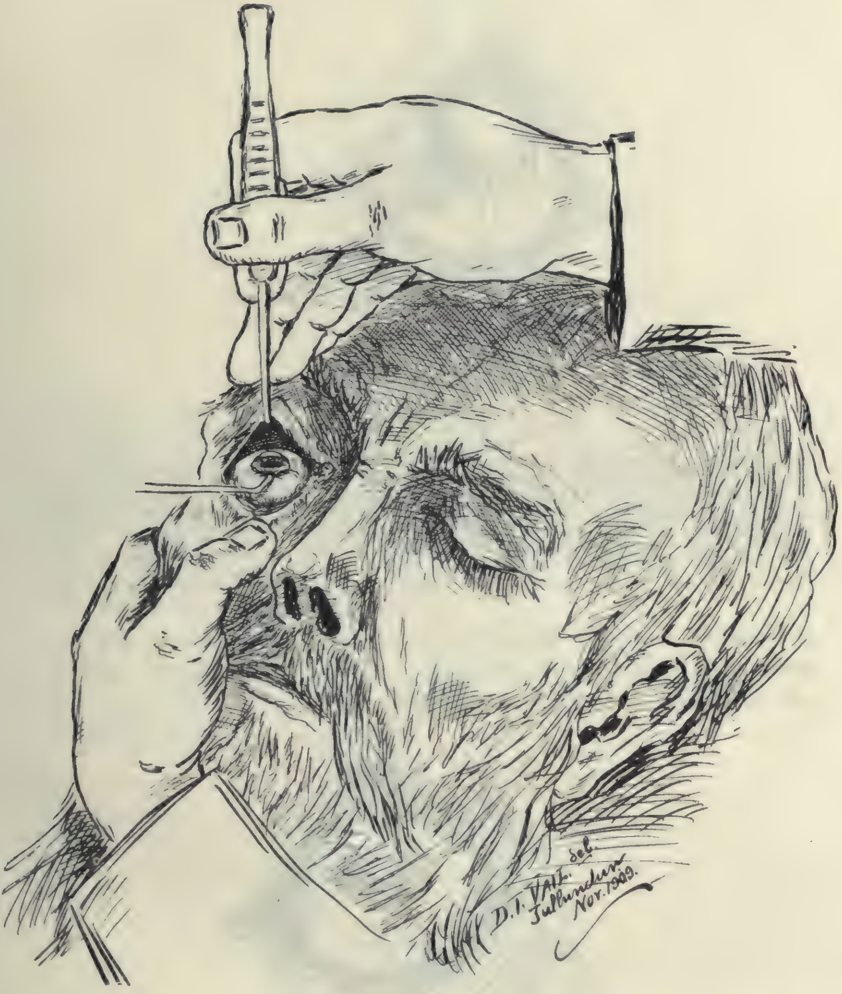

Fig. 19.—Shows how things look from in front (spectator's view), while the lids are being held by the assistant and the hook for expelling the lens is applied. Notice the gable-like space under the upper lid above the eyeball. The operator may look obliquely under the upper lid in this field and see a good exposure of the entire upper cul-de-sac. The assistant can shift this exposure to the right or left to enable the operator to have an unobstructed view of the lens and wound; also to give him access to the angles of the wound and the summit, too, when replacing the cut sides of the iris and the apron of the iris that adheres to the scleral wound after delivery.

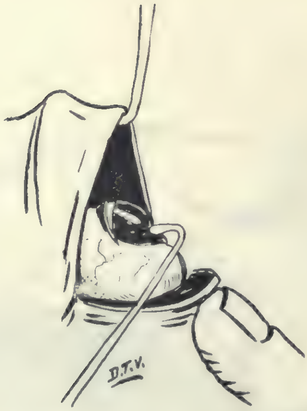

Fig. 20.—Shows where the bulbous end of the lens hook is applied in the act of pressing to expel the lens. The pressure is made "straight back toward the optic nerve" without a moment's hestitation or dallying, not quickly or plungingly, but with intelligent and bold onward pressure, never varying the direction of the pressure until you see one of two things, either the lens break its moorings above or below and show a disposition to be born, in which case you favor the exit by shifting the pressure, or the lens stubbornly refused to yield and advance because of tough ligaments, small size of the incision or what not.

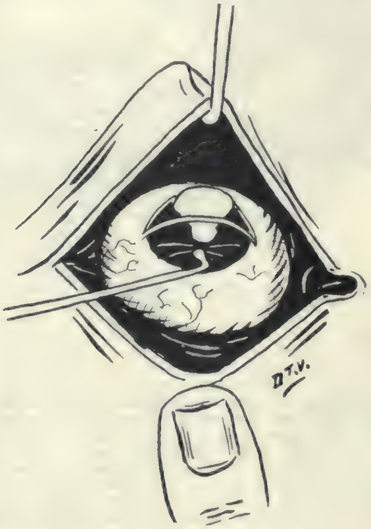

Fig. 21.—Showing front view of the same. The lens is coming up nicely and the equator will soon pass the incision. The pressure is still deep, but about to be shifted upward to drive the lens out and keep all gaps between lens and incision closed. The operator is standing to the patient's right with his head low toward the patient's chest, so that he can see exactly what he is doing. The view he gets is about as shown in this sketch.

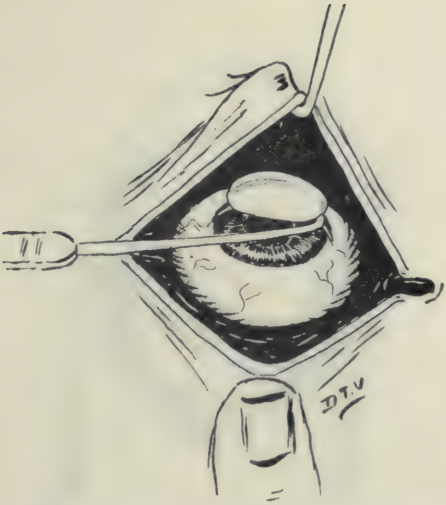

Fig. 22.—The lens lies outside the eyeball. The cornea has been tucked behind it and the operator is removing it from its last moorings, at the same time "ironing" the incision in good approximation by using the hook like a golf stick (mid-iron) is used to rake a golf ball from a pond into which it has fallen, not forcibly, but coaxingly and gently, yet making good progress, being careful that the tip of the hook is not caught in the wound. To guard against this, the elbow of the hook must depress the lips of the wound under the lens, while the bulbous end is directed nearly vertically away from the incision.

I will now show ten outline sketches from my collection, designed to illustrate the delivery a-la-Smith. The idea was borrowed from those illustrating Greene's paper read before the ophthalmic section of the A. M. A. three years ago.

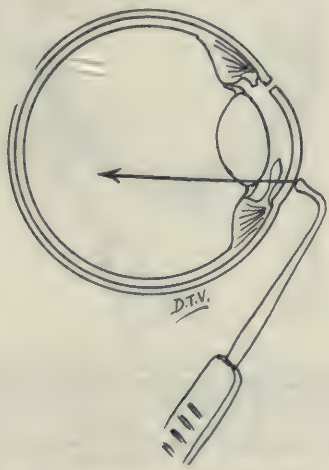

Fig. 23.—Shows first position of the lens hook as applied to the eyeball after section and iridectomy. Note direction of pressure as indicated by the arrow in each of these.

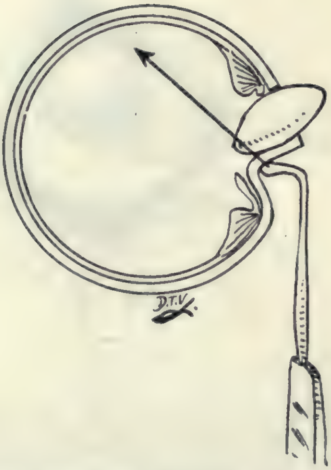

Fig. 24.—Shows lens about to be delivered upright. The cornea is being tucked behind the lens as lens advances from the eye.

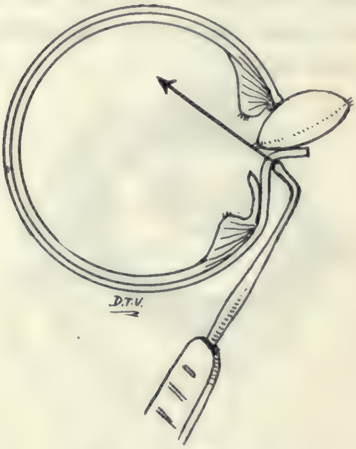

Fig. 25.—The lens is born and the cornea is being tucked under it to prevent its setting back into the eye.

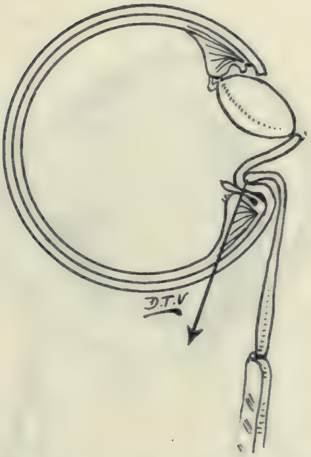

Fig. 26.—This is a "tumbler." We must favor this somersault or half-somersault of the lens by making traction away from the incision by means of the hook caught on the ciliary ridge and pulling directly toward the patient's feet and at the same time not making deep pressure.

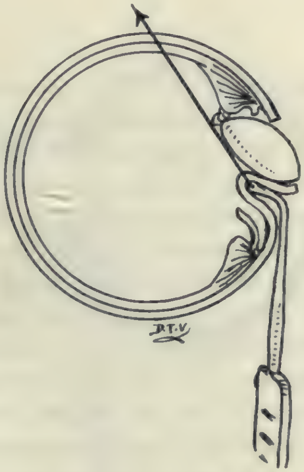

Fig. 27.—As the lens advances after it has severed its lower ligamentous attachments and is turning, the pressure is shifted to follow it up and is now no longer toward the patient's feet, but toward the top of the head to keep all cracks and gaps between lens and wound closed, to prevent vitreous escape. If traction is kept up too long, no advance of the lens will take place, but you will see a vitreous presentation as illustrated in each of the next two sketches.

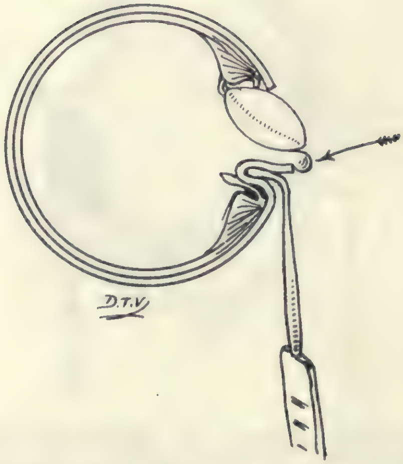

Fig. 28.—The cornea should have never been permitted to leave its hugging approximation to the lens. The pressure was continued toward the patient's feet too long.

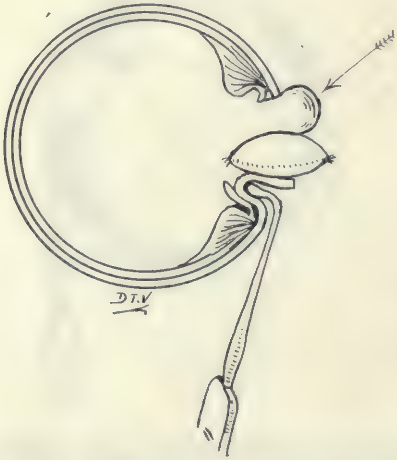

Fig. 29.—Sometimes the vitreous will present above; in fact, will do so in many of these cases where the pressure is not intelligently made with the hook below. This and the last plate show the result of clumsy operating and lack of skill.

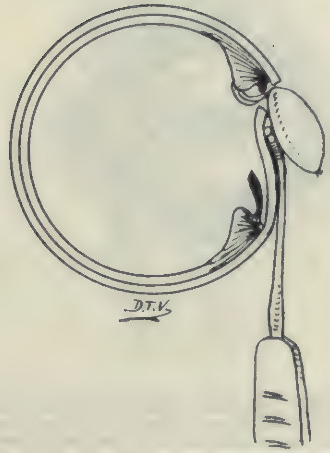

Fig. 30.—Shows the cornea tucked under and behind the lens that has been successfully delivered by turning.

As regards spoon delivery: The lens spoon held by the operator in his left hand is an emergency instrument and only used as a "present help in times of trouble." If the lens is "stiff" and refuses to move when intelligent pressure has been applied, it may mean that the eye is a "low tension" one and all that is needed to increase the tension of the vitreous and start the lens forward and cause the ligament to separate, is to apply the end of the spoon against the eyeball lightly at any point near the point of pressure being made by the lens hook. The pressure with the lens hook is kept up steadily, neither increased nor lessened, while the eyeball is given a little slow kick with the lens spoon. This will start the lens in the majority of cases of stubborn lenses.

Sometimes and unavoidably, even in the hands of experts, the lens will show a stubborn resistance, even after this nudging has been employed, until finally as the result of too great pressure, the vitreous lets go and you have now to pass the other (uncontaminated end of the spoon into the vitreous chamber behind the lens and effect rather speedy delivery by using the spoon in a two-fold capacity, first to hold back the vitreous, second, to afford a background for the lens to be forced out against.

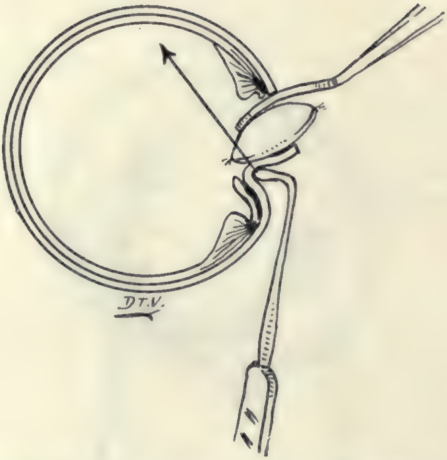

Fig. 31.—The vitreous has only "presented." The spoon is not introduced far into the vitreous, but only just behind the upper rim of the lens and slightly within the vitreous chamber. The pressure with the lens hook against the cornea has been held in abeyance during the introduction of the spoon, but after the spoon is in place, the pressure now follows the lens and drives it out of the eye against the spoon as a stationary incline plane.

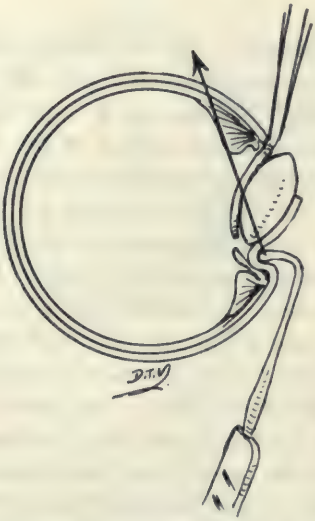

Fig. 32.—If there has been actual loss of vitreous and more coming, the spoon is dropped down behind the lens until it is deep in the vitreous and just back of the lens. The spoon is now held fixedly and the lens expelled by pressure through the cornea by means of the lens hook. Thus at no time is the spoon ever used to rake the lens out of the eye.

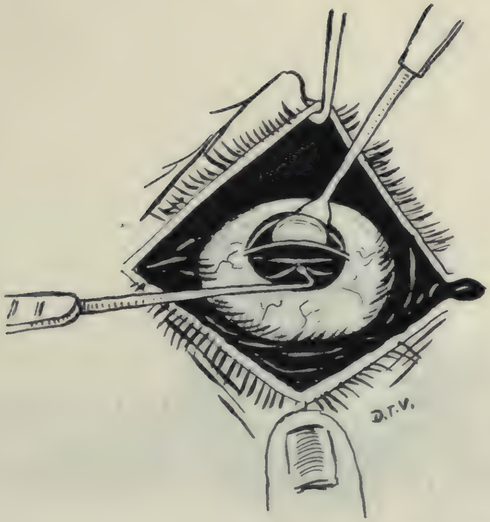

Fig. 33.—Shows front view of a spoon delivery. The method of dealing with the lens in case of rupture of the hyaloid that Smith teaches and employs, robs the operation of intra-capsullar extraction of much of the terror it would otherwise inspire, for by this technic rightly carried out and with cool judgment, there is rarely a calamitous loss of vitreous and usually if any at all is lost, it is a slight amount.

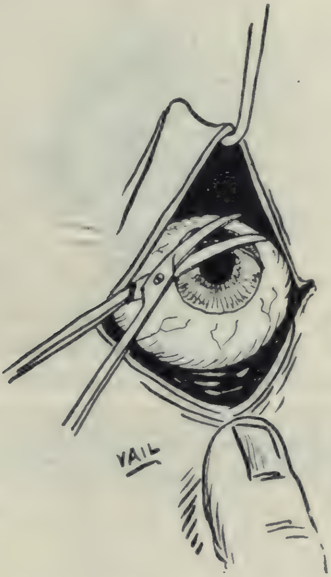

Fig. 34.—Smith's assistant will continue to control the eyelid with lid hook slightly tilted to lift the fornix tissues well away from the oall, and Smith will trim off the vitreous with a pair of strabismus scissors curved on the flat, also replacing the iris as best he can, but will not manipulate the eye very much. The assistant will pay as much attention to keeping lower lid retracted to the limit with his left thumb as he pays to keeping the upper fornix tissues from weighting the collapsed eyeball.

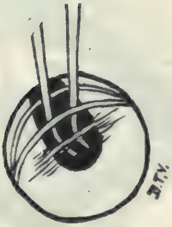

Fig. 35.—If the capsule has been ruptured and no vitreous is lost, he passes the iris forceps in the pupil space by turning the flap of the cornea down, opening the blades slowly to the indicated extent and then going deep in the patellar fossa after it; and he usually secures it on the first or second attempt. Smith says to leave a capsule in the eye is far worse for the welfare of that eye than the loss of one-third of the vitreous.

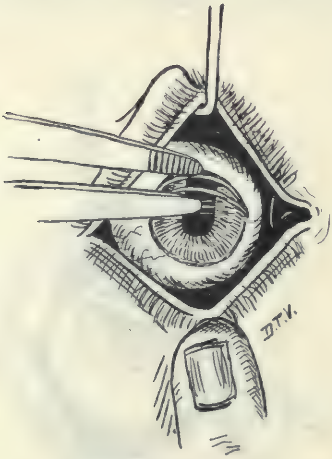

Fig. 36.—Sometimes the ruptured capsule hangs half in and half out of the wound or it lies in the aqueous chamber close to the wound. He will secure such lost capsules by the use of Weiss dissecting forceps, which instrument he uses with the same masterful dexterity that he employes in all his instrumentation.

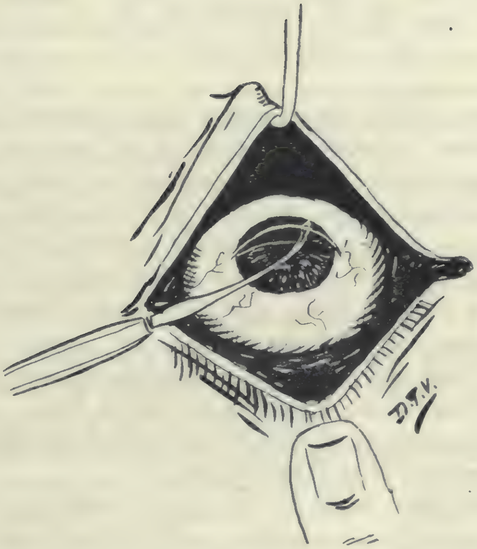

Fig. 37.—The last step is the replacement of the root of the iris and loosening the iris from the angles of the wound. This he does by passing a blunt instrument, spatula, closed iris forceps or lens hook, under the scleral lip of the wound from below. Starting at one end of the wound, he will slowly and lightly pass the blunt instrument across, between the iris and cornea to separate the agglutination that has taken place between the root of the iris and the cornea as the result of the passing out of the lens. You will notice that he does not pass the spatula from above downwards, but passes it from below upwards.

The assistant maintains an unaltered position from the time following the iridectomy until the toilette is completed. He then gently closes the eye, smears a one per cent yellow oxide ointment along the lashes of both eyes, applies a small, square patch of wet gauze, over which is placed a thin layer of cotton and a light "figure of eight" gauze bandage. The patient is carried to his bed on a canvas stretcher strung in two poles.

As regards results: I can only say that they are uniformly good as regards visual results and good as regards cosmetic results. I have always disliked updrawn pupils and most of Smith's cases presented this result to an inconspicuous degree, but the cause of the updrawn pupils was not adhesions between iris and cornea. I was delighted to notice that incarcerations and entanglements were the very great exception. I wish to repeat that the results in India were remarkably beautiful and the cornea usually very bright and clear, with good vision.

SMITH'S CATARACT OPERATION.

D. W. Greene, M. D.

DAYTON, OHIO.

When Major Smith's first American paper appeared in Archives of Ophthalmology[1] I became interested in his operation, and after reading the paper made twenty-one operations as nearly according to his directions as possible, and, like many others who have tried to perform the operation without having seen it performed by one competent to demonstrate its technic, I felt called upon to condemn it[2]; but on reading Knapp's paper after his return from Jullundur[3] and later having the privilege through his courtesy of meeting Smith in New York and having him explain the technic, and of seeing him make four operations, I came home with a better conception of the steps and possibilities of delivery of the lens in the capsule by external manipulation, than I had before.

An invitation from Smith to visit him in India was eagerly accepted, and as soon as arrangements could be made, the long journey was undertaken with Vail of Cincinnati, whom it was my privilege to have as my companion. Vail has already contributed an interesting paper on the subject of the Smith operation to The Ophthalmoscope[4].

We arrived at Bombay, September 27, 1909, two days later we were at Jullundur, the Mecca of cataracts in India. Clark of Columbus had preceded us two weeks, and we found him at work in the old hospital. His stay, however, was necessarily short, and we reluctantly bade him goodbye. He has however, favored the profession with several papers on this subject[5].

As we have two papers on the Smith operation this afternoon, it is my intention to be very brief in my remarks concerning it, in order to give plenty of time for Vail to demonstrate the steps of the operation by lantern slides. Perhaps I should not have said anything, but the title of Dr. Vail's paper indicates that he seems to think some one has strayed far from the fold and changed some of the instruments and omitted some of the technic of the Smith operation, as we saw and did it at Jullundur in September, October and November of 1909. I know from correspondence and conversation with him, that in

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1. Smith Vol. XXXIV No. 6, 1905, p. 601.
2. Greene Trans. Am. Acad. of Ophth. & Oto-Laryn., 1906, p. 70.
3. Knapp Arch. of Ophth. Vol. XXXVII. No. 1, January, 1908.
4. Vail, The Ophthalmoscope. Vol. VIII, No. 6, p. 400, June, 1910.
5. Clark Arch. of Ophth. Vol XXXIX, No. 1, January, 1910.
   Clark Ophth. Record, Vol. XIX, No. 2, p. 102, February, 1910.

naming his paper "The Unmodified Smith Operation," he had in mind certain modifications of instruments and technic which have grown into favor at Dayton. These, however, amount to very little and in no way depart from the principles Smith has laid down for delivery of the lens in the capsule. To my mind however, the Smith operation is far too much of a surgical procedure to be encompassed in a few iron clad rules of manipulation and specially constructed instruments to be used according to certain mathematical rules.

The operation is built on broader lines and is a method which covers the whole field of cataract operation, except the class of cases referred to in the text. Some of the best minds in ophthalmology in the past have wrestled with the problem of intra-capsular delivery of the lens. The multitude of instruments they have left behind and the varieties of technic they have employed all go to show that the problem of successfully delivering the lens in the capsule is not a simple one, on the contrary, *it is very complicated.*

If all eyeballs were of the same size, if the cornea always measured 11 millimetres or more in its horizontal diameter, if the lens in the capsule always measured 9 millimetres, (*about the average,*) if the tension of eyeballs was always the same, if the cataractous lens was always hard or always soft, if the section could always be placed in the same mathematical plane and always be properly proportioned to the size of the cornea and the body which is to pass through it, then I would agree that it is a simple operation, but I am convinced that along these and some other lines the difference between American and Indian patients is so great, that Smith himself could not duplicate his Indian statistics on American patients. These remarks are not intended to in any way condemn or detract from the operation, but are rather intended to help define its scope and limitations. So much for this phase of the subject which has received more attention than it was my purpose to give it. I had rather intended to refer to a few changes in instruments, and in Smith's technic in relation to toilette which I have made. I may add that all of these changes were suggested to him or were made under his observation.

When I met Smith in New York in 1908, he used a small brass speculum and lid hook and a small brass delivery hook of about the dimensions of an ordinary strabismus hook and a double ended brass spatula, each end being 8x10 millimetres which he held while operating, in reserve, perpendicular to the lower inner corneal border of the eye operated. If he was not able to effect the delivery of the lens by manipulations with the hook in the right hand on the lower edge of the cornea, he would make gentle pressure with the tip of the spatula just inside or outside the sclero-corneal border beside the point of the

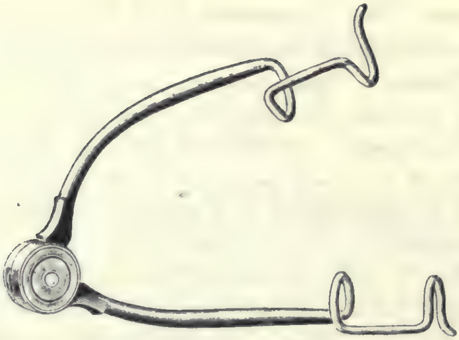


Fig. 1.

hook which was quite an aid to delivery in certain cases and the instrument was of even greater service if vitreous presented or was being lost; but I could not see the reason for having both ends of the same size. I suggested that it would be an improvement to reduce the width of one end from 8 to 4 millimetres, and I had one made for my own use, which was an improvement, *in my judgment.*

Sometimes when vitreous presents or escapes and it is necessary for delivery in the capsule to hold a flat, smooth surface between the scleral lip of the incision and the lens, to take off pressure from the vitreous while the lens is being pushed up by making on it pressure of the lower border of the cornea, or if it became necessary to pass an instrument down between the lens and the hyaloid as far as the posterior pole of the lens to support the vitreous, this narrow end will go in easier and take up less room, but its bearing surface is smaller, and it does not answer as well as the wide end for this particular purpose. Another advantage is that if the operator has not a steady hand, he can use the narrow end for pressure across the lower border of the cornea posterior, or on the flap by resting his finger tips on the malar bone.

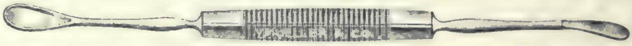


Fig. 2.

I find this instrument all right in America, where cataracts are not so abundant, but in India where large numbers had to be operated rapidly every day, *the double ended spatula was better*, because if

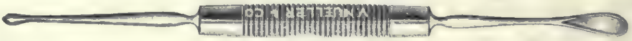


Fig. 3.

one end touched a surface which had not been sterilized, it could be quickly turned and the sterile end used. Smith is very particular about this and all other points relating to clean instruments and the field of operation.

I have lately thought that the necessary pressure could be better concentrated at any particular point on the lower border of the cornea or cut on the sclera by a probe pointed instrument, than by the flat end of the spatula, which is sharper on the edge, broader and covers a wider surface in one direction. This probe point however, is only on trial, and I am not certain that it has any advantages over the flat end.

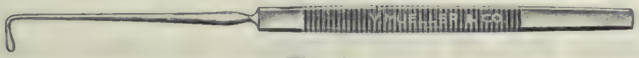


Fig. 4.

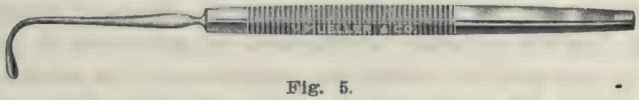


Fig. 5.

There is a stage in the delivery of almost every cataract, which is delivered straight just after it is dislocated and is standing upright in the section, and matters are at a standstill, where one of two manipulations are necessary to deliver it. Dr. Vail will tell you that in the unmodified operation you should dislocate and deliver the lens with only one instrument, *the so-called smaller strabismus hook*. (Fig. 4) I have seen Smith deliver many cataracts in this way, those presenting in the section with the upper edge first, and I have delivered many with this single instrument myself, but I think in more than a majority of cases in my experience at Jullundúr both the hook (Fig. 4) and spatula (Fig. 2) were used together especially if the tension of the eye was not full normal; 71 per cent of our lenses were delivered straight.

Under date of May 18, 1910, Major Peck, I. M. S., who is Smith's successor at Jullundur, wrote me as follows:

"I have only had four Smith's extractions returned with no sight. In all of them I was unable to get a view of the fundus, due to vitreous opacity. I did six hundred cataracts between January 1 and April 30, 1910. The last two-thirds by Smith's method, and had very good results, very few prolapses of iris, thanks to your method of replacing it."

I personally know that Peck was not favorable to the Smith operation before coming to Jullundur, but in his case, as in that of Major Birdwood, who made 311 operations and severely criticised the operation, when he came to Jullundur and saw Smith operate, and operated under his direction, became a convert to the method.

I have not used the 1/2000 bichloride solution from a glass container suspended five feet above the operating table as Dr. Vail will describe to you, because I have not felt the need of such treatment to the normal conjunctivæ, which is the rule with us. The Ziegler flushing bottle has answered my purpose, using normal salt solution.

I have examined six hundred men above sixty years of age in my clinic at the National Military Home, near this city, in whom the average horizontal diameter of the cornea was about 11¾ millimetres. The average diameter of a number of lenses just removed from this same class of men has averaged in the capsule about 8¾ m/m. At Jullundur the average horizontal diameter of the cornea was 12 m/m. and a large number of lenses 9 m/m. measured roughly with a small millimetre rule.

Colonel Maynard, I. M. S., Calcutta (Ind. Med. Gazette,) has reported measurements in sixty-one eyes with cataract which show that the average horizontal diameter of the cornea was 12.05 m/m. and of the lens 9 m/m. when just removed from the eye. The lens seems not to vary as much in diameter as the cornea. It is evident from these measurements that if a cornea does not have a horizontal diameter above 9½ m/m. the lens would be pinched and squeezed to a dangerous degress in expressing it. I believe a knowledge of these proportions and relationship of one part of the eye to the other has more to do indirectly with the success or failure of the operation than all other causes combined. In other words, "L'operation de la cataracte, c'est la section."—Terrien.

A marked peculiarity of the Indian eye is that the corneal wound in nearly all cases separates after exposure of the anterior lip, falling downward and backward; this exposes the iris up to its insertion, and it can be replaced and smoothed out in ways that could not be followed with our people, who are better fed, have higher average blood pressure and higher average tension of the eyes and more orbital fat to keep the eye full and prominent.

After leaving India I thought of Smith's original way of replacing the iris with the so-called strabismus hook, which was too large, and the improved way of replacing it with the flat end of the repositor which I thought could be improved, therefore I had the silver probe end of the repositor bent to a right angle with the shank 2 m/m. from the end for the purpose of replacing the iris. *I have been pleased with it* as have some others who have used it. With the patient looking high up and the operator standing on the right side and directly in front, and confining all efforts at replacements of the pil-

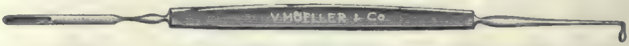


Fig. 6.

lars of the iris to the iris itself the hyaloid is not in danger of rupture and vitreous is seldom lost.

It is quite generally believed that Hindus enjoy a degree of immunity from post operative complications, to which they are entitled by reason of the simplicity of their lives. They live close to nature, and have been called children of nature. They may, and perhaps do enjoy some immunity from the germs to which their conjunctivæ have become immune from constant contact. A large proportion have trachoma, but if a new germ is introduced into the conjunctival sac, they are quickly infected, and I have seen as severe cases of panophthalmitis in Jullundur as I have ever seen at home. Those who insist on these degrees of immunity forget the other enemies which attack the natives by day and by night, and make them unhealthy and cachectic; dysentery, plague and malarial fevers are his worst enemies. It was shown at the Bombay Congress, February, 1909, by Lord Minto that there had been one-hundred million cases of malarial fever in 1908, with two million deaths. From this standpoint, the Indian is not a good patient.

It was the plan at Jullundur to keep patients quiet in bed with the eyes well bandaged for several days, but the want of nurses, made close supervision over them impossible. Often in going through the wards of the hospital the next morning after the operation, many of the patients would be found sitting up in bed with a sheet or blanket over their heads, the bandage badly disarranged and in many cases removed.

Elschnig (1) has made the following statement, which I think should be corrected. It is manifestly unfair to the operation and detracts from one of the most skillful manipulations of the intra-capsular delivery. "I wish to add that in many cases of expression, the superior edge of the lens appears first in the wound. In others, however, the lens is dislocated upon its horizontal axis, so that the inferior edge is first delivered, while the posterior surface of the lens looks forward. The operator is not able to effect either the one or the other delivery at will." In our experience at Jullundur *twenty-nine per cent of all lenses were turned over.* They were diagnosed as suitable for this method of delivery; in fact, every lens with soft mushey or milky cortex and a small nucleus will if *properly manipulated,* take the hour glass form in delivery, and can be turned over. A full sized sclerosed lens will not turn for want of room.

In this method of delivery, as soon as the lens has moved well out of its bed and is standing upright in the section and inclines to fall forward, the operator should fold the cornea under it and not touch

1. Elschnig Ophthalmology, Vol. VI, No. 3, April, 1910, p. 353.

the capsule with the point of the hook. This is not usually difficult, but if he fails to deliver the cataract with the single hook he should make gentle pressure backward with the small end of the spatula, at the sclero-corneal junction below, and he should be careful to keep the lens pressed well back against the posterior lip of the incision to prevent vitreous escape. He should also be careful at this point, if need be, to only use the concavity of the hook to roll or draw the presenting lens edgewise out throught he incision. The point should be held well up where it will do no harm to the capsule. If the capsule ruptures during these manipulations, it usually results from one of three or four causes. First, the section is too small; second, the cataract has ripened so rapidly that the capsule is so stretched, that it will not stand the manipulation of delivery; third, by the point of the hook touching the capsule in the effort to fold the cornea under the lens. If the cataract has been correctly diagnosed and has been made to turn over (tumblers Smith calls them) and the capsule ruptures, it usually hangs out of the wound, from which it can be easily extracted by a wide-bladed forceps; but if it ruptures when the lens is coming straight through the wound, the capsule usually recedes, and it is seldom possible to catch it with forceps and withdraw it, Smith treats such cases in the following way:

He introduces a pair of long iris forceps flat-wise and turns the point backward, opens the blade widely and grasps the capsule, and he generally succeeds in tearing a hole through it, and sometimes extracts it. A better way, I think, in this country, is to treat such cases by the ordinary discission method.

The toilette of the operation was very simple at Jullunder after the delivery of the lens. Smith would use the point of the small delivery hook to replace the iris if it had prolapsed into the angles of the wound but the bulbous tip was too large to go well down into the angles hence every prolapse was not freed, and we sometimes saw the tendency to drawing up of the pupil, which experience has shown me always results, if the pillars of the iris are left entangled.

After-treatment of these cases has been more necessary in this country than in India, where the eyes were usually red and iritated for a few days, but made prompt recoveries. This was attributed to the strong bichloride solution, 1 to 2,000 used in every operation but after returning home and continuing the operation without the use of the bichloride, I observed about the same reaction. The eyes were redder and looked more irritated than after the regular operation and cleared up slower; while this condition is so often present, absence of pain during the healing is generally observed; *there can be no mistake about these patients not having much pain.*

After the regular operation painful inflammatory complications are sometimes met with, and often put the eye in jeopardy from the severe inflammation itself or its results. After intra-capsular extraction a different picture is present and different treatment is indicated. I do not know the pathological conditions present in a red eye not painful, seldom chemotic, with iris and cornea clear but with more or less opacity of the vitreous, which under other conditions would not clear up and vision improve say from 20/100 or 20/70 to normal in a few weeks, but I do know that it is possible for it to occur after treatment after this operation, having seen it many times.

It is not my intention to even intimate that complications severe and sometimes fatal to the future integrity of the eye may not follow the Smith operation, on the contrary, they do among our gouty and rheumatic patients, but they are seldom of the painful inflammatory type observed after capsulotomy method, and I have been impressed over and over again that the difference in these reactions depends largely on the location and character of the inflammation. Painful inflammatory complications in the anterior segment of the globe are rare after intra-capsular operation, but opacity of the vitreous, etc., is more often seen after intra-capsular delivery unless the delivery has been uneventful.

If complications arise, longer confinement in bed is necessary, free purgation is indicated; holocain and large doses of one of the preparations of salicylic acid or colchicum are indicated, and dionin 10 per cent solution or stronger, or still better, dusting a small quantity of the cornea, have yielded the best results in my hands. The mercurial treatment so highly thought of by the English profession, I have not tried to any extent, but the testimony of so many competent observers in its favor should entitle it to a fair trial.

Probably the most important contributing factor to the success of men who discuss this subject, seem to think the question of the future of the cataract operation is settled. So far as the old operation is concerned, this may be true, it having been extensively practiced since 1753, now 157 years, it has probably reached its limit of improvement in technic and visual results. But there are men who regard the future of the cataract operation as still an open question, and with the hope and possibility of attaining to the ideal operation, are not satisfied to stop and throw up their hands. They believe that Col. Smith has offered us a reasonably safe and practical series of manipulation[1] by which the lens can be delivered in the capsule with a sufficiently high degree of success to constitute a new operation. I happen to have had excellent facilities for acquiring some skill and technic in performing his operations at home; and to gain further proficiency in the method, made the journey to India, where I operated about 400 times under Smith's direct supervision, which I consider necessary to success with the method.

It is not worth while to say anything more about the technic of the Smith operation, after Dr. Vail's thorough expression of the subject. I believe however, I should say that I do not regard the operation as suitable for all cases of cataract. I do not employ it in all cases myself, and would not advise others to do so.

I think the great field of usefulness of the Smith operation will ultimately be found in the treatment of immature cataract. This I think is self-evident, but much can be said in its favor in the treatment of other kinds of cataract, in which it is possible to make a selection of cases which will favor the operation and the statistics of the operator. One for example: If you have a cornea with a horizontal diameter of 11 m/m. or more, and a sufficient section, then you can express the lens in the capsule with ease. In the chapter I am writing for "Wood's Aphthalmic Operations." I fully discuss the section and the corneal-lens measurements just referred to. *Smooth and easy delivery of the lens in the sine qua non of success in the operation.* As has already been stated you cannot crowd a large body through a small opening without undue traumatism and subsequent reaction, the section which it is possible to obtain with safety, in a 9½ m/m. cornea, is too small for the average lens in the capsule to pass through, therefore, this horizontal measurement of the cornea is a contra-indication for the operation.

I am sorry that the opportunity for testing the value of a preliminary iridectomy on a large scale could not have been tested in India, but since coming home I am making a test of a hundred cases. The indications for making a preliminary iridectomy are no where more marked than in intra-capsular extraction. Theoretically I believe in it, and practical experience so far has justified the belief. Delivery is slightly more difficult, but the improved appearance of the pupil and comparative freedom from iris entanglements over balance the former.

1. Smith, The Treatment of Cataract, Calcutta, 1910.

THE CHOICE OF A CATARACT OPERATION.

W. A. **Fisher**, M. D.
CHICAGO, ILL.

While some definite method of performing a cataract operation may not be settled upon by all members of this society at the present meeting, it is nevertheless one of the most important questions awaiting our decision. The result which promises the best permanent vision is the one that should determine the kind of operation. The amount of time lost to the patient need not be considered if one operation offers better results than another. The one great and only consideration is vision. Before deciding on any method of operating it will be well to eliminate everything that has a tendency to give the patient poor vision There are very many accidents that may be prevented and all of these should as far as possible be eliminated. Major Smith has done much for the advancement of the intra-capsular cataract operation, but how many of us will perform the operation the way he does? His technique, however, has so many advantages that all of us can profit by studying it. We have all been taught to stand behind the patient while doing a cataract operation, and to instruct him to look down during the expulsion of the lens. This must be learned over again, and we are indebted to Smith for this great lesson. There is no reason why the Smith technique cannot be adopted by all of us, even though we persist in doing the old operation and cutting the capsule with the cystotome.

Preventable Accidents. The loss of vitreous occurring at the time the incision is made, can usually be prevented by discarding all kinds of specula and holding the lid away from the eye by a lid retractor (Fig. 1). This lid retractor was devised by me more than five years ago and has been in use by many operators long enough to test its worth.

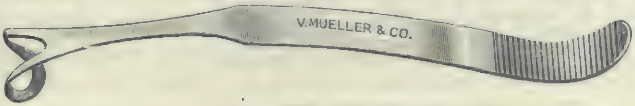


Fig. 1.

Dr. Jamison, of Belfast, Ireland (Ophthalmic Record, Feb., 1910), writes that during the winter of 1908 and 1909 he had the privilege of personally operating on six hundred and eighty cases in the Jullundur clinic, and loss of vitreous occurred in thirty-five cases out of this number. In nine of them it was due to the forcible squeezing of the lids and the consequent shooting out of the lens and some vitreous on completing the corneal incision. This loss of vitreous in only about five per cent of his cases is certainly good work, but nine of these cases occurred just as the incision was finished and could have been prevented by proper control of the lids. This would reduce his percentage of loss of vitreous to about four per cent. Dr. Greene, one of Smith's aptest pupils, has discarded the speculum because of this loss of vitreous, and now relies upon the lid retractor in making his incision. If operators like Jamison and Greene cannot avoid the loss of vitreous because the patients squeeze the lids together at the time the incision is made, what can one expect of men who do only an occasional operation?

Faulty Position of the Eye. Faulty position of the eye during the extraction of the lens is the cause of many preventable accidents. Dr. Greene says, and many bear him out in the statement, that if all the other complications occurring at the time of the operation were put together they would not equal this one, namely, that of the patient looking down after the incision has been completed. M. Landesberg, (Arch. of Ophthalmology, 1878), found much trouble in having his patients look down, although they were very willing to do so, but from fright, bashfulness and other reasons their eyes would remain in one position—upward. He therefore made his incision downward, which removed much of the annoyance. Eyes usually turn up after the incision is made, and remain in that position during the extraction, unless the patient is requested to look down. In my choice of an operation, I will describe the position of the patient's eye during the extraction.

Capsule Forceps. When capsule forceps are used there are two great dangers. The first one is that the patient must look down in order to introduce the forceps, then if he looks up while the forceps is in the eye there is a very great danger of dislocating the lens. Many operators have discarded the capsule forceps and have relied on cutting the capsule with the capsulotome in order to let the lens escape. Most operators would perfer to remove a piece of the anterior capsule with the capsule forceps if it could be done without danger. I have devised a capsule forceps which can be used while the patient is looking up (Fig. 2). There is no danger of dislocating the lens, because the patient is looking up when the forceps is introduced, and if he should

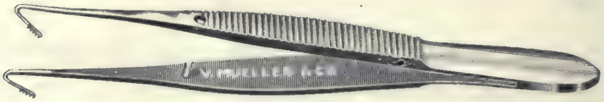


Fig. 2.

suddenly look down, the forceps would be out of the eye without any effort on the part of the operator.

Preliminary Iridectomy. A preliminary iridectomy should always be done, because the operation in itself is practically devoid of danger, and the extraction, which is performed a few weeks later, is simplified.

The Choice of a Cataract Operation. The choice of a cataract operation cannot always be decided upon before the operation is begun. It is impossible to determine what kind of an operation should be performed before the incision is finished. Much depends upon the incision, the size of the lens and the condition of the zonula. It would be subjecting the patient to great danger to persist in doing an intra-capsular operation when the incision is small, the lens large, or no degeneration of the zonula existed and much manipulation was necessary to expel the lens.

My choice of operation for cataract is as follows:

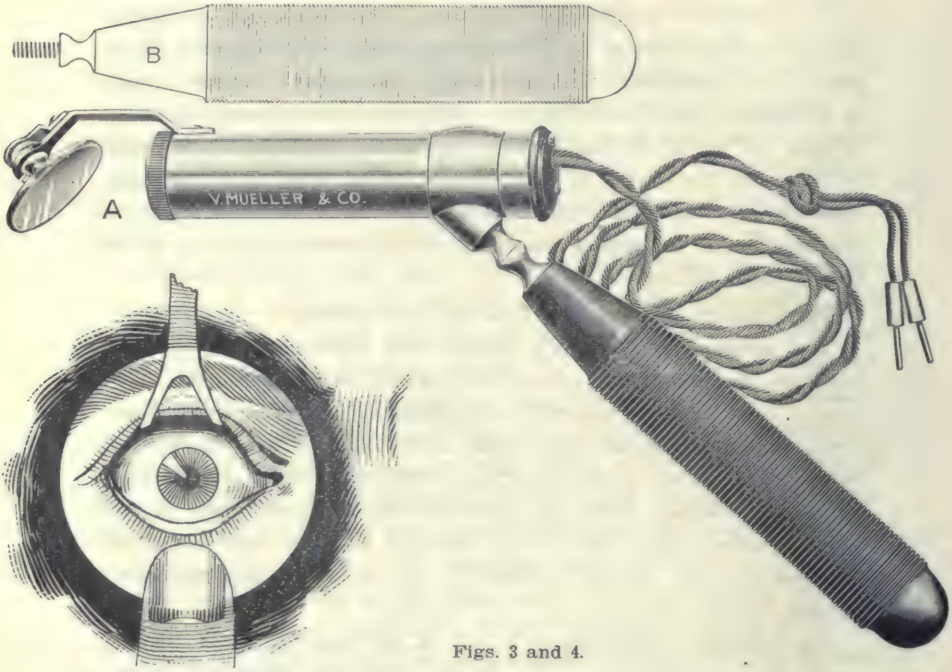
The preliminary iridectomy having been performed, the surgeon, assistants, instruments and patient are perpared as in any surgical operation. The eye is cocainized by dropping in two drops of a 4 per cent. solution of cocaine three times at intervals of five minutes, the lashes are cut close to the lid at the outer canthus, the lid retractor (Fig. 1) is inserted under the upper lid and held away from the eye by an assistant, who holds the lid retractor with the right hand and depresses the lower lid with a finger of the left hand while the incision is being made.

The Incision. The incision is one of the most important steps in any kind of cataract operation. If a good deep incision is made the intra-capsular or any other method of operating can be readily accomplished, but many operators insist in making the puncture and counter-puncture in the cornea. If the puncture and counter-puncture are made as deep in the sclera as can be done with safety, and the incision is finished with one sweep of the knife, coming out about two mm. from the sclero-corneal junction, as recommended by Smith, any kind of extraction will be simplified.

The Light. A good operation cannot be performed with a poor light, (Figs. 3 and 4 represent the light and the lid retractor in position). I find this light far better than day light or any other kind of reflected light I have ever tried. An assistant can throw the light just where the operator wants it.

Where Should the Patient Look? Some kind of an object should be placed on the ceiling for the patient to look at, provided he has enough vision to see the object. If he cannot see, he should be instructed to look straight at the ceiling, but never to look down. This will give the eye a good, quiet position for the patient and a good field for the operator.

Position of Surgeon. After the incision has been completed the surgeon changes his position from behind the patient to the right side and in front of him. The assistant does not remove the lid retractor, but keeps the eye open while the surgeon makes gentle pressure on the lower part of the cornea with the hook (Fig. 5) as is done in the intracapsular operation by Smith. If the lens presents in the opening with slight manipulation it is easily expressed in its capsule. If gentle manipulation does not make the lens present, the capsule forceps (Fig. 2) is introduced closed from above downward into the eye, when it is opened a piece of the capsule is grasped and removed. The capsule forceps is now opened in a 5 per cent. solution of carbolic acid to make sure that a piece of the delicate capsule has been removed. If a piece of the capsule has been removed, it can be seen in the solution. If no capsule has been removed, the forceps can be dipped in alcohol followed by normal salt solution and again inserted as before.



Figs. 3 and 4.

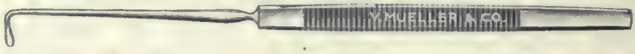


Fig. 5.

The lens is now extracted by slight pressure on the lower part of the cornea with the Smith hook (Fig 5). The experienced operator (I want to emphasize the word experienced) should be cautioned at the time the lens is being expelled, because from force of habit he might tell the patient to look down. The lens can be extracted quite as well when the patient is looking up, while the other position would subject him to great danger.

The Toilet. Arranging the toilet is the same as is done after any cataract operation, Knapp's instrument (Fig. 6) being the best adapted for the position of the patient looking up. The iris should be replaced if prolapsed, and any cortical or capsule fragments remaining in the wound should be removed. The patient should at this time be instructed to close his eyes and the retractor should not be removed until after they are closed.

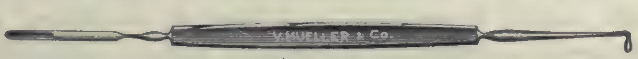


Fig. 6.

Bandage and After-Treatment. The bandage should now be applied. Different opinions are expressed regarding the after-treatment. Some good operators do not disturb the bandage or give the eye any treatment for a week, when the bandage is removed, and the eye is ready for dark glasses. Other good operators have various methods of after-treatment, some going so far as to leave the eye bandaged for only a few hours. If a good, clean, deep incision has been made with one sweep of the knife, leaving the edges of the wound perfectly coaptated, there will probably not be any great difference in the result of the operation, no matter what method of treatment is carried out. Probably fewer complications will follow the least treatment. If the patient does not complain after a cataract operation, it is quite safe to presume that he is getting along well, and any interference might only produce some complication. To make sure that no complication exists and at the same time not interfere with the eye, it is a good plan to remove the outside dressing at the end of the third day, but not to open the eye if the patient does not complain and the lids are not red or swollen. If all is well at this time, no further treatment other than a bandage is necessary for four days, when the patient is ready for dark glasses.

Should the Intra-Capsular Operation be Recommended? This is a question that should be carefully studied and decided as soon as it can be done in a practical manner, and the operators of large experience are the ones to settle it. There is certainly no objection for operators of large experience trying the intra-capsular operation, provided a good deep incision has been made. If the incision is deep, the lens small, or the Zonula degenerted, it will not take much pressure to tilt the lens and deliver it in its capsule. But, if the lens does not appear in the wound with very little manipulation at this step, it will be better to use the capsule forceps, and deliver the lens in the same manner as we would in the intra-capsular operation. There seems to be no reason why all operators whether they be of large experience or small, should not insist on their patients looking up instead of down during the expulsion of the lens, whether this be in its capsule, according to the Smith method, or out of it, as in using the capsulotome or the capsule forceps as devised by the author.

THE OPERATIVE MANAGEMENT OF ATYPICAL CATARACTS. JUVENILE. NON-SENILE.

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Ophthalmic surgeons are pretty well agreed as to the operation of choice in what we may call the typical, *i. e.*, the mature senile form of a cataract. There is practical unanimity of opinion as to the value and scope of iridectomy, preliminary or contemporary, anterior chamber irrigation, the conjunctival flap, various forms of fixation, and while the advantages as well as the dangers of extraction in the capsule have been widely discussed without, as yet, allowing us to draw absolute conclusions, the impression is general and well founded that this modification in its present form is too hazardous to be generally applied.

In marked distinction to the progress which has been made in systematizing and perfecting the operation for senile cataract, we note a marked divergence of theory and practice in the treatment of what I shall call atypical forms of cataract. This is expressed in the variety of operative procedures employed by different surgeons, and on different occasions by the same operator, by the lack of a definite plan in the teaching conveyed by text-books and instructors in ophthalmology, and even by the divergence of opinion on so fundamental a point as the operability or non-operability of this form. The question has hardly been formulated, to say nothing of its being still subjudice. It is the object of my presentation to consider the commoner forms of non-senile cataract, to bring out discussion as to the fundamental principles which should guide our judgment and lead us to a decision in the matter of treatment, and to point out some of the dangers and complications which in my experience and those of the ophthalmologists whose work in this field I have studied for some time, present a special problem as interesting as it is important.

Under the broad title of atypical cataract I include, as indicated, all those which do not come under the head of senile cataract. We may divide these into a number of large groups; the congenital cataracts, of zonular, polar, or purely nucleo-cortical tpye; juvenile cataracts, and traumatic cataracts. Diabetic cataract, lenticular sclerosis, and special forms, usually seen in middle life, as glass-blower's cataract and others similarly due to the action of radiant light and heat, are excluded from this survey as they are all, more or less, to be considered as senile cataracts, at least as far as their clinical manifestations and operative management is concerned. The factors of immaturity, constitutional disease, refraction error, and capsular anomalies which they present are problems which confront us, quite similarly, in the senile forms. The lens in high myopia forms a borderland type and should be considered in passing, as far as it affects children or young adults. It is rather striking that the operation of juvenile forms of cataract, with the not invariable exception of the traumatic variety, is a comparatively recent development in ophthalmic surgery. Congenital cataract, especially, was in former days a *noli me tangere* for many, as it still is for some surgeons. The introduction of intracapsular and anterior chamber irrigation has greatly simplified our task in this respect.. It offers valuable aid in the removal of opaque lens masses through a small or linear incision, thus removing at one and the same time two prolific sources of danger to the eye and of operative failure, namely, irritation by retained lens masses, and escape of vitreous through a corneal flap incision.

Leaving the traumatic cataracts for our concluding paragraphs, we may state some broad generalizations as to the determining factors in all the juvenile forms. Let us take up, first, the question of what we expect to accomplish, the possible improvement in vision, appearance, and consequent social and industrial benefit to the patient, and then the method or methods by which we may expect to accomplish our object. The prognosis quoad visum is perhaps of even greater practical importance to the child or young adult than it is to the aged. The restoration of sight in congenital cataract means the possibility of education, collegiate or industrial, and eventually of more or less complete self-support. The practical importance of this consideration can hardly be exaggerated and is rendered still more striking if we stop to consider the long probable life period of these patients as compared with the remaining years in senile cataract.

The economic significance both to the individual and to the State is apparent. In the case of young adults, too, the economic importance of removing even unilateral cataract is shown by the difficulty experienced by these subjects in getting remunerative employment in competition with individuals of normal appearance, leaving out of the question, for the present, the factor of stereoscopic vision and its quantitative value for accurate short-range eye-work. The cosmetic factor is to a certain extent implicit in the economic problem. Many patients with unilateral cataract are quite satisfied if we can promise to free them from the disfigurement of one "white eye," and are content with a prospect of little improvement if any in the vision of the diseased eye, if we can promise them that its fellow will not be affected injuriously by the operation for cataract. The cosmetic question enters also, as we shall see, into the question of means as well as that of ends to be gained.

In many, if not all forms of atypical cataract we may take it for granted that we have to deal with a more or less unsound eye. For our prognosis this means that we must be extremely guarded in our promises to the patient as well as in our own hopes as to functional improvement which is to follow our intervention. Fortunately for both, there is little to be lost and much to be gained, as the failure to improve vision merely leaves matters in *statu quo* as far as function is concerned, while the appearance of the patient may be greatly improved. Again, even if we have but poor vision as an operative result, this means much more for the young patient who has never seen, than for the aged who had good sight before the development of senile cataract. 20/100 in the latter case would be, practically, a partial failure, while in the case of the young it would mean practical success.

The cosmetic side of the question imposes on us two main desiderata, the complete removal from the pupillary area of the opaque lens matter and, hardly less important, the avoidance of all operative disfigurement. In this connection I wish to refer for a moment to iridectomy and its purely cosmetic features. In senile cataract operations the removal of part of the iris causes less apparent disfigurement than in the young. As complete removal of the lens is usually possible, the coloboma is not very strikingly evident. Again, the danger of iris prolapse is so well worth considering that we may take the iridectomy as by far the lesser of two evils. In juvenile cataract there is less danger of iris prolapse. Atony or rigidity of the iris, the two prolific causes of prolapse, are not present to anything like the same degree as in old age, and there is less vis a tergo in the form of intraocular pressure to cause incarceration or extrusion.

In children and young adults an iridectomy is a positive blemish. As we may not succeed, especially in zonular forms, in removing all opaque matter, the less of the lens surface exposed to view the better, for this particular purpose. We want above all to get a clear black pupil and only considerations of safety for the eye should induce us to sacrifice this cosmetic improvement by the addition of an operative coloboma. The reasons for performing the iridectomy have been mainly a fear of adhesion of the iris to the lips of the wound or of prolapse during healing. I believe that this danger can be averted by the choice of a suitable operative procedure. This choice is determined largely by the consideration that up to the age of twenty-five or thirty we can count on the necessity of removing only soft masses and possibly a very small nucleus which is not of dense consistency, in the zonular forms.

These juvenile or young adult cataracts are soft, that is, there is no nucleus or but a very small one which is never very consistent. As to the age at which the nucleus develops there is some difference of opinion. Up to the age of twenty-five one is generally safe with a small keratome incision. After that one must be prepared for a nucleus even if small. The presence of a nucleus may sometimes be demonstrated by oblique illumination and the elicitation of Hess' nuclear reflex, but I have failed in this more than once. I have the impression from my own cases that the development of the nucleus takes place somewhat later in women than in men, so that in a woman of thirty one might expect a completely soft cataract. Capsular changes are common, as might be expected from the traumatic and inflammatory factors in the causation of this form of cataract, and for the same reason adhesions of the iris in the form of posterior, more rarely of anterior synechiae, as well, may be encountered. Having to deal almost invariably with soft lens masses we find it possible to dispense entirely with the flap incision which, as we well know from our experience with senile cataract, may easily give exit, not only to the lens, but to the iris and vitreous as well. The comparatively rapid healing of a linear section is of course an added advantage in children and young adults, who cannot be trusted to maintain the philosophic attitude of uncomplaining quiescence that we expect and usually find in the aged.

Even starch bandages and sleeve pinning do not relieve us of apprehension as to possible accidents in the post-operative stage and every day by which this stage is shortened means a greater chance of success. It is not only during operation but after it that the flap incision with its tendency to gape is a source of danger. With the linear incision we have nothing to fear on this score. Two other malign possibilities, that of infection and of iris adhesion (prolapse being excluded) while not entirely eliminated, are at least greatly reduced. The only valid or apparently valid objection which has been raised against the linear incision with a keratome is the supposed necessity for performing an iridectomy to avoid adhesion. If we can dispense with iridectomy there is nothing to be gained and much is risked, by flap operation. I believe that adhesion can be prevented almost always in the linear operation, and that if iridectomy should be necessary it can be performed through a keratome incision at the limbus quite as well as after flap section. Our main reliance for prevention of iris incarceration lies in the rapid and definite restoration of the anterior chamber and a position of the corneal section as far as possible from the pupillary margin. The first of these two desiderata is gained most effectually by a linear incision, the second, by the keratome incision and full atropine mydriasis kept up for some time after operation. It is another drawback to the flap incison that this mydriasis predisposes to iris incarceration and to the even more serious complication of iris prolapse and loss of vitreous, both of which accidents are practically excluded by the keratome incision. It is this instinctive fear of loss of vitreous and prolapse of iris in the flap operation of juvenile cataracts which leads some surgeons to operate with an imperfectly dilated pupil. An attempt is made to enlarge the field by means of an iridectomy but as we often have to deal, as noted above, with a diseased eye, we may find that the iris is partially adherent and that it bleeds freely when cut. The effused blood obscures the field, mingles with the lens masses if capsulotomy has been performed, and is not easily washed out. All these incidental complications are avoided if one can eliminate the iridectomy, and our chances of a clear pupillary field are immeasurably increased. Again, not only capsular after cataract but the retention of cortical masses is minimized in proportion to the thoroughness of irrigation which in soft cataracts is our main reliance for the removal of opaque lens substance, and irrigation can be employed much more thoroughly and deliberately after a linear section than with a flap wound as we are not hurried by the apprehension of losing vitreous. As we must count on partially if not completely fluid vitreous in many forms of juvenile cataracts and on a defective zonule as well in the traumatic cases, the danger of vitreous prolapse is much more imminent and common than it is in senile cataracts where it forms or should form the exceptional complication. A procedure which will free us from anxiety as to this accident must have another point placed to its credit. We cannot count on children to be docile and to assist us in the operation. Even if free from pain they may not hold still. A general anesthetic is required as a rule instead of exceptionally as in the old. Here, again we have an added reason of great cogency for avoiding a flap incision. Restlessness even in narcosis, straining or vomiting, add immeasureably to the dangers of the operation, both as to prolapse and infection, while a linear incision safeguards the eye to a very large extent. Even if the operation has to be interrupted, the conditons are very much more favorable where we may count on almost immediate restoration of the anterior chamber and rapid healing of the operative wound. Finally the probability of having to deal with a thickened capsule and with the necessity of extracting it with forceps or if this should be found impossible, of cutting through it in several directions with De Wecker scissors, is a last point in favor of the linear, and against the flap incision. I have seen operations left uncompleted, and wisely so, for fear of getting prolapse of vitreous in the attempt to cut a dense capsular band in the latter stages of flap extraction of congenital cataract. It is true that such thick capsular remnants can be cut at a subsequent operation without fear of complicating vitreous prolapse, but if this can be done at once it enables us to get out all opaque lens masses by irrigation and this can never be done later on. I may refer in passing to the evident consideration that an intact iris, a linear section as such and its position in the cornea some distance from the limbus all tend to prevent escape of any large amount of vitreous, and that under these circumstances our manipulation of the capsule forceps or De Wecker scissors can be deliberate and untrammeled and correspondingly effectual.

It is not necessary to go into minute details of technique in this connection. The essentials of operative manipulation may be summed up quite briefly. General anaesthesia for children and for those young adults whom we can not count on from previous minor procedures about the eye, to be absolutely tractable and passive. Intelligent patients may be put at rest, physically and mentally by the administration of a hypodermic injection of morphine, grs. ¼, and hysocine, grs. 1-150, an hour before operation. In case of any contra-indication to these two procedures we have a valuable substitute in the subconjunctival injection of a weak, ½ per cent. solution of cocaine, as practised with excellent results by Koller. It is the only means of local anaesthesia by which, for instance, an absolutely painless iridectomy can be ensured, and deserves wider general adoption. Full dilatation of the pupil is essential. In case of posterior synechiae this is even more important, and every means should be used before operation to break up existing adhesions. Failing this, an attempt may be made to free the iris by means of the cystotome or even De Weckers scissors, preferably before capsulotomy.

The site of the corneal incision will depend to some extent on the possible degree of pupillary dilatation obtainable before operation. I like to make the section about one-third of the way from the limbus to the horizontal meridian of the cornea, using a medium sized angular keratome, and using up the full width of the blade. This necessitates carrying the point well down toward the opposite iris angle, another reason for dilating the pupil fully and thus avoiding injury to the iris. Capsulotomy should be free and peripheral, and if the capsule is thickened an attempt should be made to exsect this portion and to extract it with capsule forceps. Irrigation is then employed, the tip of a small glass irrigating tube being supplied close behind the distal wound lip and a stream of normal saline solution of body temperature allowed to flow with some pressure from a rubber bulb through the anterior chamber. The exit of cortical masses is greatly aided by introducing a narrow spatula or iris repositor within the lips of the wound and making gentle pressure just sufficient to cause it to gape slightly. The tip of the irrigator and the spatula may have to be carried from one angle of the wound to the other and the direction of the irrigating stream changed in order to get at various masses in the anterior chamber or within the capsule. This manipulation should be kept up until the pupillary area is perfectly free or until we have convinced ourselves that irrigation alone will bring out nothing more. Patience and lightness of touch are necessary, but we need not hesitate to keep up the irrigation much longer than we would dare to do in the case of senile cataract, for the reasons already detailed. The restoration of the anterior chamber may be aided by continuing the irrigation after removal of the spatula from the wound. A drop of 2 or 3 percent. atropine solution should be instilled and the eye bandaged carefully. A mask is then adjusted but the unoperated eye should not be covered up. My experience with this method has been uniformly successful and gratifying. In only one case that I can recall was there any complication on the part of the iris. Full mydriasis had not been effected and there was a small linear adhesion of the iris to the inner corneal edge of the keratome incision which could be detected only by careful examination. Under ordinary conditions it was not apparent.

I am aware that there is nothing original about the procedure I have detailed. I know of a number of surgeons who practise it uniformly and skillfully, but I also know of others who keep to the flap extraction in spite of what I consider serious objections to it, and others who being in doubt as to what form of operation offers most chances of success avoid as far as possible, all operative intervention in cases of atypical cataract.

Zonular or Lamellar Cataract. This form presents a firm and dense but small nucleus and some of the layers may be of high consistency. A single needling is rarely sufficient to cause complete opacification and homogeneity sufficient to allow extraction by flap incision, and absorption is generally slow and often incomplete. The nucleus has often been allowed to remain in the anterior chamber and gradually disintegrate. It seems to me a much more satisfactory procedure to apply the linear extraction to this class of cases as well as to purely soft cataract, making a somewhat larger keratome incision about half way between the limbus and the center of the pupil, breaking up the anterior layers with the cystotome, and irrigating gently but persistently

Needling operations form a routine procedure with many operators and good results are often obtained. However, a single needling may have no apparent effect even in an obviously soft cataract. The necessity for several operations is not only an inconvenience but an actual danger in young patients, as they are repeatedly subjected to the danger of intraocular infection, disturbance of the bandage and consequent interference with prompt healing, and the chance of actual injury to the operated eye during the healing process. Again, the presence of swollen lens masses lying against the iris or partially filling the anterior chamber is by no means a consummation to be desired. I merely refer in passing to the comparative frequency of iritic and cyclitic inflammation and the occasional causation of acute glaucoma in these cases.

CONCERNING CONGENITAL CATARACT.

COMMENTS UPON SIXTY-SIX CASES IN THE OHIO STATE SCHOOL FOR THE BLIND.

JOHN EDWIN BROWN, M. D.
COLUMBUS, O.

The relative infrequency, in private practice, of cataract of the congenital type as compared with cases of adult life and the senile form should be sufficient ground for this presentation. My own private cases have been few—a bare half dozen operated. The opportunity to observe and study these cases among the pupils at the Ohio State School for the Blind opened up to me an interesting field in eye disease, for which I had little opportunity elsewhere. It is not my intention to deal with the many phases of lens pathology for there are students and pathologists much better qualified by research work to speak upon these points, but to bring to your attention some points which more particularly concern us as clinicians.

In the period covered by my records of admissions, which date back fifteen years, there have been admitted to the school sixty-six cases of blindness due to congenital cataract—44 males and 22 females. This number seems sufficiently large to allow one to make some classifications and deductions that might be more than suggestive—that might be actually helpful to some whose experience with such cases may be comparatively limited.

As to the proportion showing consanguinity in these sixty-six cases, there are the following groups:

(a) Three brothers, with the history of a similar lesion in the mother.
(b) Two sisters and one brother, and at home (not a pupil) an infant brother similarly afflicted.
(c) One sister and one brother.
(d) One sister and one brother.
(e) Two brothers.
(f) Two brothers.
(g) Two cousins.

Imperfection in records renders it probable that this list does not shows all related cases in same family; i. e. of brothers and sisters, but shows sixteen cases related.

In twenty-seven of the sixty-six admissions, operations had been performed on one or both eyes previous to admission to the school. Of those that entered with both eyes unoperated, twenty-two have since had operations at the school.

We can use these groups for purposes of comparing visual power:

(1) Visual rating of unoperated cases.

(2) Visual rating of those operated before entrance which, it may fairly be presumed, means operated at an average younger age than those

(3) Operated after entrance into the school.

In these groups we tabulate eyes rather than patients. As can be expected where opacity of media exists, where there is imperfect development of the neuroretinal tract—probably ametropia—nystagmus, squint and more marked amblyopia of one eye are frequent. The wide variation in degree of visual acuity may be supported therefore, in the same patient, by a fair degree of vision in one eye and bare P. L., or slightly better, in the order.

TABLE I.

Visual Rating of Cases of Eyes Unoperated.

20/20, none; 20/30, none; 20/40, none; 20/50, two; 20/70, none; 20/100, two; 20/200 to 10/200, nine; less than 10/200 and better than poor form vision (ability to count fingers at variable distance), thirty-one; perception of light only, thirty; totally blind, one.

Thus in seventy-five eyes, the vision in sixty-one is less than 10/200. In thirty cases, or 40%, it is no more than light perception. Taking those cases under 20/70 as ones able to read ordinary print even with difficulty, we find but two eyes, or a total of 97% unable to read.

TABLE II.

Visual Rating of Cases of Eyes Operated before Entrance into the School.

20/20, none; 20/30, two; 20/40, none; 20/50, none; 20/70, two; 20/100, none; 20/200 to 10/200, six; less than 10/200 and better than poor form vision, twenty-nine; perception of light only, thirteen; totally blind, two.

In this table, covering fifty-five eyes, we find two cases rated at 20/70, and two cases with better visoin, enabling eye to be used for reading; thus over 92% were not able to read ordinary print.

TABLE III.

Visual Rating of Eyes Operated after Entrance into School.

20/20, one; 20/30, one; 20/40, five; 20/50, one; 20/70, one; 20/100, six; 20/200 to 10/200, eight; less than 10/200 but better than poor form vision, seven; perception of light only, two; unknown, one.

In this list of thirty-three eyes only two are as low as perception of light, while one is 20/70, and eight, or 25%, have ability, with more or less difficulty, to read ordinary print.

TABLE IV.

Or, making a group of cases where vision is 20/70 or better we find of those cases with vision equal to:

20/20, unoperated eyes, none; operated before entrance, none; operated after entrance, one.

20/30, unoperated eyes, none; operated before entrance, two; operated after entrance, one.

20/40, unoperated eyes, none; operated before entrance, none; operated after entrance, five.

20/50, unoperated eyes, two; operated before entrance, none; operated after entrance, one.

20/70, unoperated eyes, none; operated before entrance, two; operated after entrance, one.

TABLE V.

Visual Rating of Eyes Operated at O. S. S. B. before and after Operation.

(1) Right, before, 20/100; after, 20/40; Left, b. 20/100; a. 20/30;

(2) R. b. fingers 10 ft.; a. 20/200; L. b. fingers 8 ft.; a. 20/100;

(3) L. b. fingers 2 ft.; a. 20/100;

(4) R. b. fingers, 4 ft.; a. 20/100; L. b. p. l.; a. 20/100;

(5) R. b. p. l.; a fingers;

(6) R. b. fingers; a. 20/200; L. same;

(7) R. b. 6/200; a. same; L. b. 12/200; a. 20/100;

(8) L. b. p. l.; a. same;

(9) R. b. fingers 10 ft.; a. slt. imp.; L. b. fingers 10 ft; a slt. in;

(10) R. b. (?); a. 10/200; L. b. (?); a. 15/200;

(11) R. b. 12/200; a. imp. (?);

(12) R. b. p. l.; a poor f. v.;

(13) R. b. f. v.; a. 10/100; L. b. f. v.; a 20/40;

(15) L. b. p. l.; a. no imp.;

(16) R. b. fingers 3 ft.; a. 20/70; L. b. fingers 3 ft.; a. 20/40;

(17) R. b. fingers 6 ft.; a. 20/50; l. b. fingers 1½ ft; a. 20/20;

(14) R. b. p. l.; a. f. v. (slt. imp.);

(18) L. b. p. l.; a. imp. good f. v.;
(19) R. b. 20/200; a. 20/40; L. b. 20/200; a. 20/40;
(20) R. b. fingers lft.; a. 20/100;
(21) L. b. fingers; a. 20/100;
(22) R. b. p. l.; a fingers.

This table is given to show what improvement was gained by operation in each case. In this there was wide variation, from ability to count fingers at 1½ feet to 20/20, to no improvement.

We are told that we should operate early in congenital cataract to prevent amblyopia of high degree, and to stimulate retinal activity at an early age. I began my work on these cases having that in mind. There has been nothing in my personal experience to make me feel that the age of the patient at the time of operation had anything in particular to do with the final result obtained. The cases in which vision of 20/50 or better was obtained were, on the average, no younger than those in whom less acute vision was secured. It seems to me that the degree of vision secured when the pupillary space was freed from opacity depended upon conditions of the nerve and retina which obtained from the beginning.

We recognize the eye showing congenital cataract as a pathological organ in which the lenticular opacity is simply a manifestation of altered or diseased conditions which obtained in the uvea and other parts of the eye—and partial micro-ophthalmos may indicate how seriously the development of the eye has been affected. There are practical difficulties of operation and after treatment in the case of operation upon infants, and, when complications arise the patient's age seriously interferes with the procedures the surgeon wishes to have carried out.

So far as the ultimate vision is concerned my experience is that an operation at six, eight or ten, will give as good results as one at the age of one, two or three years. I would now be governed by the degree of vision in the eye in determining time for operating. If there was a dense opacity, involving the whole lens, and vision was p. l. only, I would operate one eye at least before the age of three years, and if a good result was obtained, the other also. If failure followed the first operation, I would wait until the child was of age sufficient to at least not interfere with the measures to be carried out, even if not able to co-operate.

If the opacity was less extensive or dense, so that there was somewhat better than f. v., and the child thus enabled to get about and use this vision in play, I would wait until the sixth or seventh year before operating. In institution work where parents or friends may be more ready to criticise failures than in pay private work, I have usually chosen the eye of poorer vision for first operation, and allowed the patient or pupil to decide as to whether the second eye was to be operated if no benefit was secured from first operation.

My next impression to be formed was in regard to iridectomy in this class of cases. The number in which this formed the procedure of choice was very small—two. Despite the fact this retains the lens and accommodative power, the other conditions necessary to make it preferable—the transparent lens beyond the nucleus—have not often been found in the institution cases.

In the posterior polar, peri-nuclear and zonular opacities, the anterior capsule does not present the problem which it does in the forms where the opacity involves the anterior capsule itself. In these latter cases, following discission and absorption of the lens, there is generally a marked tendency for proliferation of cells with a resultant dense opaque membrane in the pupil. If, as in many of these, a calcareous pyramid is found attached to the capsule at the anterior pole of the lens, the result of discission is *nil* so far as vision is concerned, and such a membrane is exceedingly difficult to lacerate in a way to leave a clear pupil, or to extract.

Now and then one rarely finds absorption has gone on in a way that the dense membrane lies in what was the fossa patellaris, with loose attachments, so that by keratome and capsule forceps it can be practically lifted from its place without traction—but such cases are rare. More often repeated attempts at laceration or extraction are made before the pupil is cleared. To obviate this possibility, and as the best method to secure a clear pupil, my aim in beginning operation is first to lacerate the capsule freely, a mydriatic having been previously used, and to break up not only the corcital but the nuclear portion of the lens as well, in the hope of getting fairly rapid swelling. As soon as the lens is sufficiently broken up, even if high tension has not supervened, linear extraction is made. After the first escape of softened cortex it is usually possible to enter with capsule forceps and remove the anterior capsule and, if present, the small calcareous pyramid which, if left behind, results in the formation of a dense membrane. After this the removal of the remainder of the softened lens material may be easily completed.

In these cases the lens does not imbibe the aqueous as rapidly as in the zonular and posterior polar opacities. A later discission is not always needed when this has been the order of procedure, and if called for, the membrane has little resistance, and it is easy to secure a perfectly free pupil. In one patient with posterior polar and perinuclear opacity there was observed in both eyes the same incident. As the last of the softened lens material escaped from the corneal wound, the hyaloid membrane ruptured, the tear being like that of a three pointed star. No vitreous escaped and the resultant vision was 20/40 and 20/30 respectively for the two eyes.

After securing a clear pupil by discission in some cases the vision has depreciated—apparently from choroidal disease, and where reading vision has been secured it is doubtful whether these eyes can stand as many hours in close work, even with refraction corrected, as do normal eyes, without some cases showing deterioration. In two eyes good reading vision has been lost through chorio-retinal disease arising later.

The introduction of the table of visual results in eyes operated before entrance may be misconstrued. It may be regarded as probable that of all eyes operated in infancy those in whom the best visual results were obtained; i. e., 20/40 to 20/20, would be the ones more apt to never enter the School for the Blind. Therefore, it may be presumed that in a table including all such operated cases there would be a larger percentage with a better visual result than this shows. But, granting this, I feel still convinced that such a complete table would not show a superiority in results over the table of those operated after beginning school life. The difference to my mind would be more apparent, especially in those of p. l. vision only, and in mental conditions. A child deprived of vision for objects is hampered in mental growth as compared with one that his this ability. On the other hand I am positive that in a large number of cases operated on over five years of age there will be fewer total failures than in a similar number operated under that age.

DISCUSSION.

Dr. Walter R. Parker, Detroit:—When Major Smith first published the results of his operation in 1905 I became enthusiastic over the possibilities of such a procedure. I did an extraction in the capsule and published the result in the Ophthalmic Record of April, for 1906. So far as I am aware, this was the first case published in this country of intentional extraction in the capsule. Since that time I have done thirty-five.

It is very difficult for those of us of limited experience to give comparative results that will be of value. We must, therefore, rely largely on the experience of those who have visited Major Smith, for our best method of procedure.

I believe it is much more difficult to perform than the old operation, and I would not advise one who is not experienced in the cataract operation to attempt it. When it is successful, nothing is more simple, but when the lens refuses to come, or when it comes and is followed by a loss of vitreous, the condition is most distressing. It seems to me Dr. Fisher hit the nail on the head when he says, we should not adhere to any fixed procedure. If we attempt the extraction in the capsule and the case starts out to be a difficult one, it is much better to abandon the procedure, and extract by the older method, than to subject the eye to undue manipulation.

One of the best lessons of the two papers that have been presented today is: Do not attempt to remove the lens, but rather attempt to push the cornea behind it. If this can be done successfully, the lens will be delivered properly.

As for the method of procedure in the classical operation, I have for the past several years instilled atropine in every cataract extraction, when there is no contra-indication for so doing. Make a large incision including a conjunctival flap. If the pupil is well dilated and the iris shows no tendency to prolapse, I make a simple extraction; otherwise an iridectomy is done. In my last 150 cases I have used the capsule forcep and I believe it has great advantages over the cystitome. The lens itself is more easily expressed, and there is less risk of leaving corticle matter behind. If the corticle matter is not easily expressed, I believe the anterior chamber can be irrigated to good advantage.

Dr. Reeve, Toronto:—The reader of one of the papers spoke of instilling cocaine three times at intervals of five minutes, which makes ten minutes at least before the operation. I believe it is better to instill the cocaine only five or six minutes before the incision is made. If you wait too long you reduce the healthy tonicity of the eye.

We have been told of the treatment of certain classes of atypical cataracts in juvenile subjects, but no specific annular cataract, which is certainly atypical and requires more care than the oridnary cataract which involves the whole lens. My practice has been for twenty-five years in juvenile cases to do free discission of the anterior capsule if possible without evacuation of the aqueous humor and allow free maceration for a few days. Then if a rise in tension does not necessitate earlier interference, at the end of a week or ten days linear extraction and incision made with a narrow Graefe knife of two or three lines in length and one line from the corneal margin, and the lens substance coaxed out and passed into the anterior chamber. In addition to this, the more recent McKinnan's method has been a valuable expedient. I have never done iridectomy in these cases, which I believe produces an unnecssary blemish of the eye.

In regard to the annular cataract, we often find its nucleus is not soft. It will fall down to the bottom of the anterior chamber; but, if it cannot be removed it is better left alone, as it will gradually become smaller by degrees and does no harm.

Then in regard to the choice of the Smith operation, all credit and honor are due to the ardent disciples of Euculapius for the time, and expense, and trouble they have incurred in going to see the operation of Smith and doing so many operations themselves. But, what is the ultimate result? We are all agreed that the safest operation, which gives the best visual result is the best, and I am still inclined to hold to the belief that with a slight improvement on the standard operation well done, we will have recourse to the Smith in only exceptional cases. The main indication—and this was the experience of Maj. Dingley at Oxford, who has done thousands of these operations in India—that it is the coming operation for unripe cataract. I believe for Anglo-Saxons the standard operation, if in the first place we clear the anterior chamber as far as possible at the time of operation.

I have found the use of the capsule forceps, and secondly the operation of McEwen, the most valuable adjuncts. I would call attention to the statistics of 90 percent of the cases, where the use of the capsule forceps did not require secondary discission. In the Ophthalmic Review, on the staff of which is our own colleague, Dr. Edward Jackson, for August, 1910, is a copious extract from the Indian, in which Maj. Littell (?) of Bombay, who has done the Smith 600 times, and has discarded it except in exceptional cases, tells us that after the meeting there a year ago, he got Maj. Smith to do 23 of his own operations in Bombay, and of these, only one got an absolute result of 6/15 to 6/20. They had 6/30, etc., and there were seven cases of iritis, and he thinks the resort to the Smith operation, in his opinion is unwarranted in the majority of cases.

Dr. Valk, New York:— It seems to me, after thirty years of work in the operation for cataract, that there are five things essential; one is the section, another the capsulotomy, the third the extraction of the lens, fourth, gentleness of technique, and fifth, statistics.

(Illustrations at board.) I have performed this section for twenty years, and yet have never heard it spoken of except in one work as the shoulder incision. It is made in this way (illustrating). Atropin is never put into the eye. If the patient is in front of us, the object is to have the edge of the knife cover the edge of the pupil. The knife is carried in, and the first position of the knife will be like this (illustrates). When it comes to that position it is held perfectly steady, and the point is carried forward and upward. (illustrates). The heel of the blade is then carried up and back. The knife is now rotated on its axis about a quarter of a turn, and then completes the upper part of the section in this way; there are three complete cuts in the incision. That is called the shoulder incision. It was illustrated in a paper by Weeks in the Journal of the A. M. A. After that we have the capsulotomy. In this we have this section (illustrates.) The needle point cystitome, with a needle point goes straight down. This is carried through the section and into the pupillary space, the point is turned down and carried under to this point (illustrates). This needle point comes around, and pulls the iris out of the way, and passes on around until it comes back to the point from where it started, consequently making a complete circle in the anterior capsule. This is illustrated in the Ophthalmic Record, August, 1908, p. 387. After that comes extraction of the lens. A long time ago when I was a young man, Prof. Herman Knapp taught me that when you want to extract a lens, simply place your spoon on the lower part of the cornea, and make your pressure in line with the center of the eye-ball and don't move it until the lens comes out. Make steady pressure on the lower part of the cornea until the lens turns and comes right out. In most cases it comes without difficulty. With this method I have very few discissions, only one or two in a hundred, and very few complications after the operation is made in that manner.

Dr. Stueber, Lima, O.:—If I understand the essayist, the discussion and diagrams, the section for the Smith operation, as commonly done, is not near the limbus, but far in cornea. In the classical operation I like to get near the limbus and strive to obtain a corneal flap. I think this is an advantage, as healing is more rapid and the patient suffers less pain.

If I rightly understand Dr. Green, he does not advise the Smith operation in ordinary cases; however, advocates it in immature and stationary cataract, and I can readily see the advantage if done in these cases. Personally, if I were to have an operation for mature uncomplicated cataract, I should prefer the classical operation and that with an iridectomy.

Dr. Young, Burlington, Ia.:—If every man had the same suppleness of fingers as every other man, the same steadiness of manipulation as every other man, we could lay this down as a hard and fast rule for cataract operation; but these are not possible. So far as I am individually concerned, there is nothing so difficult for me in cataract operations, as manipulation of the iris. I have made the simple extraction for years, even in pupils not wholly dilatable. Typical of these are the diabetic. I have the lens come out as smoothly in these undilatable pupils as any others, and with as little reaction. This matter of getting the iris in place is an exceedingly difficult thing for me. Some say in injuries they get prolapses and replace them; but they don't stay replaced for me. As for preliminary iridectomy, I do not do this, as I have a little superstition. A friend of mine said that a man without superstition was fit for the "batty house." I have had three cases with preliminary iridectomy, all failures, and so I have this superstitution.

Touching Dr. Fridenberg's paper, I have used lavage as routine for several years, but I do not understand how that is going to come out through an opening of 3mm. Otherwise I think he is quite correct.

Dr. Brown's paper is interesting to me, because a case came to me, a child, under two years of age, whose parents had consulted a neurologist on account of other defects, and he insisted the cataract should be operated upon; but I took the ground that there was not enough to be gained in the mental development to warrant the operation during the teething period.

Dr. Emerson, Orange, N. J.—Relative to the use of cocaine, I went home from St. Louis A. M. A. meeting and adopted Savage's dictum for cocaine. Formerly I was often called up from the hospital to find what percentage of cocaine, but now I tell them it is 4 percent four times, every four minutes, and I am not asked now every few days as to what percentage I want it. Four percent, four times every four minutes.

Dr. Keyser, Lexington, Ky.:—In regard to the corneal flap, I think whether conjunctiva on the cornea or not depends on the case. With the white ring about it I try to make the incision below the white mark. Otherwise, with a clear cornea, I make the conjunctival flap.

Dr. Byington, Kalamazoo, Mich:—I do not use the shoulder incision in an old or feeble person. I tried it in one case, in which there was a very tardy closure of the wound without any other apparent cause than the fact that the incision was too far into the cornea. There was very little reaction in the eye following operation, and the wound did not close for more than ten days.

Dr. Sherman, Cleveland, O:—Why should we depart from the established and acknowledged right course of procedure? Why should we forget in the exploitation of this new method that the patient has something to do with the operation? We are not operating upon an inanimate body, but upon a human being, who has a conscience, a fear, whom we cannot depend upon to behave as we desire. I have witnessed the Maj. Smith operations; if the patients had behaved nicely the results would have been satisfactory. It was not the faulty technique, but the unreliability of the patient that attributed to the questionable result. I subscribe to all what Dr. Reeve has said and adhere to the old classical operation and adjust myself in every case to the situation that occurs at the time. We know what we want to do—viz to extract the lens with the least possible danger to the eye with the hope of the largest possible vision. There are definite methods. Whether we get the double conjunctival flap or the single flap, or whether we operate at the corneal margin or a line over or a line within does not matter. We have the hope of doing certain things. But the man with a moral sense of responsibility will never for a moment hesitate to change and adapt himself to the situation at hand. That man will be successful. I adjust myself instantly to the condition that occurs by reason of the patient's conduct, or faulty technique. If we are men of science we have no right to exploit any one method for the purpose of personal agrandizement. A man has but two eyes, and when he loses them it is next to life itself. But there is a condition we never can depend upon and that is the conduct of the patient upon the table, and the intelligent man should adjust himself at all times to the relation of the patient and never forget it. I protest that these operations are of no great advantage when we look back upon the magnificent records of men who have adhered to certain classical methods from which they have never departed, and which I hope the best men in our profession will stand by as Dr. Reeve has done.

Dr. Keiper, Lafayette, Ind.:—With reference to the operation upon the eye that has cataract when the other eye sees, is an open question. We should caution the patient that he will not have the vision in the bad eye that he has in the good. They suffer disappointment in that they do not see as well as they hoped. But, you can hold out to them that you offer them in the operation protection against flying objects, etc., I believe that will accomplish a great deal of good for them.

With reference to cocaine instillation, it does not make any difference what percent you use, under five percent., but it is good to drop cocaine into the other eye. It helps the patient gain better control over himself than otherwise.

With reference to congenital cases, I do not personally hesitate to operate on any case that comes along. No one needs vision more than the person in the formative stage. I will picture a form I have just run across and operated on in the last few months. The condition was present in each eye of a boy of eight. (Illustrates). The boy has some vision. (Illustrates). The discission was made on each lens, and he has very good vision with a+300 D lens for each eye for distance. If you have a trauma I believe in not being in too much of a hurry unless the foreign body is located within the eyeball. I have had three or four cases where by watching them they cleared up nicely. One, a negro, 65 years old, had total absorption, and also in another case of a man of 45 where a a piece of steel remained in the ciliary body for six or seven years though with my protest.

Dr. Lewis, Buffalo, N. Y.:—First I want to remind the gentlemen of the great difficulty of getting absorption of the lens in a child under a year old. Most have that experience in the discission of these lenses and find that needling is not followed by absorption.

In regard to the use of cocaine, after using it as ordinarily I found prolapse of the cornea at the end of the operation, on account of lack of resistence of the patient. Therefore, I now use it four minutes before the operation.

Dr. Jackson, Denver, Colo:—With regard to the Indian operation, Dr. Greene kindly initiated me at Dayton; but I have not attempted to repeat the operation. From him and from others who have gone to India, and from the writings of the Indian surgeons who have taken up the Smith operation with marked success, I gather that they all believe that mastery of the operation requires an apprenticeship running into one or two or more hundreds of operations done under the master's eye; and I believe that mastery of the technique of any one of several operations will be much better for the interests of the patient, than to experiment with a technique that promises a great deal in certain directions, but which we are assured by those best acquainted with it will require a prolonged effort, and an opportunity most of us do not have, to master it. I gather that the Smith operation is an operation for those who will do large numbers of extractions. It is not an operation for those who do not repeat it a great many times. Taking into account my age, and the number of cataract operations I do, I think I am not justified in undertaking the Smith operation. I have extracted in the capsule in a number of cases where I knew the capsule was loose, and shall continue to do it occasionally. But that is not the Smith operation.

Dr. Fridenberg, (closing discussion):—The objection to the discission; Dr. Keiper has had a number of juvenile cataracts and he operates by discission. But you can accomplish everything with a keratome discission. You may have to repeat the other, and why not do the section right away? The 3 mm. incision I referred to is for purely soft cataract. In individuals up to 25 years of age you can depend on a soft, flabby, cataract. When you have a thickening of the capsule you will have to use a larger incision. Dr. Reeve will agree with me that the lamellar cataract did not always do well with discission. It is not always well to let masses remain in the anterior chamber, as they will set up an irritation in the process of doing that. There is a difference in the substance of the two. But with a free use of the keratome and forceps you get a better absorption area.

The question for breaking up the nucleus, I am in the habit of using a cystitome in that case. I am afraid to go deep in my effort to break up the nucleus, especially in traumatic cases ; if you do any deep pressure you will get vitreous into the anterior chamber. Be very gentle.

Dr. Brown, (closing):—I realize that there must be a difference of opinion with regard to the choice of time for operating these juvenile cataracts. I am surprised and pleased to learn that there is as much sentiment as is apparent in favor of some procrastination in the time of operating. It was my experience this last winter to operate in private practice on three cases of congenital cataract of under three years of age, and I am sure these were attended with greater difficulties than cases five to six years of age or older. The one destructive case of iridocyclitis that I have had in all my cases was one of these, a child of two. I think we can apply the rule here that it is not always the method, but sometimes the operator, that contributes to the successful results obtained in these cases.

I feel that I have had greater success with the use of cold compresses in the after treatment in older cases; and in the very young their use to me has seemed to be less satisfactory. In some of these, we have an extensive free exudate, where the reaction is at all marked. In some of these cases we see in the teeth or elsewhere, a manifestation of inherited syphilis, and I think the cataract must in some be interpreted as one of the manifestations of the attenuated syphilis.

I began this work with the idea that if I made a discission of the lens, and did not have high tension following, that I need not make an extraction, but wait for absorption of the lens material. I have now thoroughly revised this opinion. I think as soon as the lens is fairly swollen, one should evacuate the lens substance and attempt to extract the anterior capsule. I believe it is one of the claims of the Smith operation, that the remnants of the capsule in the eye lead to deleterious results. Certainly in the congenital cataract, the anterior capsule, if not removed, often leads to the formation of a very dense membrane in the pupil.

Dr. Fisher, (closing):—I feel that I have had a narrow escape in the discussion of this symposium. The Indian method of extracting the lens has been criticised on general principles, but I can not understand why operators who have never performed the operation in this manner should criticise it. In fact, I do not think any of us should too strongly criticise any operation we are not familiar with.

Dr. Smith has performed enough of these operations to warrant careful consideration. I have not recommended the Indian operation in any given case, but have recommended that it be tried up to a certain stage, and if the case is favorable, the operation could be completed without mishap. If the lens does not present in the opening with very little manipulation, the Indian method can be dropped and the operation finished after the capsule is ruptured.

My method has not been criticised by any of the speakers, probably on account of their objection to the Indian method and on general principles. Several of the speakers have confessed that they have not tried the intracapsular operation and do not think they will. I hardly think this fair to themselves, when the operation can be tried without any danger, and if it is not found satisfactory, finished in the manner they have done for many years. If much manipulation is necessary to expel the lens, the operation can be finished in the manner I have recommended, and that is simply to stick to the Smith technique, in holding the lid away from the eye and having the patient look up instead of down.

I do not see how any one can make a mistake in that manner. The important step I have introduced is to remove a piece of the anterior capsule while the patient is looking up without inviting complications.

I feel that the intracapsular operation would soon find its place, if we operated in this manner. If we operate with a strange technique, and have poor results, it would be better for us to cultivate that technique, if it offered better results, providing this could be done without causing any trouble.

In anser to Dr. Young, will say that I have been an advocate of the simple operation for ten years, but the simple method offers too many complications in performing the intracapsular operation. If the intracapsular operation is attempted, and iridectomy should be done, and I prefer a preliminary one.

In answer to Dr. Reeve, will say that I do not consider an iridectomy a mutilation of the eye, nor does it offer any complications. I feel tnat a preliminary iridectomy lessens complications.

The principal point I want to make is this: The intracapsular operation should be tried in all cases, and in order to do it, a proper incision must be made. Second—if the operation cannot be finished with slight manipulation, the capsule forceps may be used without any danger, and the operation can then be finished with better prospects of vision than it would be if the capsule had been cut or scratched.

Dr. Vail, (closing):—You may have noticed that the title of my paper is "The Smith **Unmodified** Operation." I thought you would have more interest in seeing the way Major Smith does the operation. I differ in opinion and practice from many of the points of technique shown in the pictures, and in that connection I wish to say that Dr. Greene is justified in pursuing certain lines of technique that suit his own hand and his own purpose. My paper was on the Smith operation as done by Smith in India. I use Dr. Greene's hook for replacing the angles of the iris and I like it very much. I wish to endorse also everything Dr. Fisher has said regarding the proper attitude of the profession toward the Smith operation at the present time. A reasonable attempt should be made to deliver the lens in its capsule, but if for any reason it does not move out nicely, further effort should be abandoned and the operator at once return to the old operation.

Regarding Dr. Sherman's remarks I was pleased to hear him say that he had been teaching this section for thirty years. It is the correct incision.

Regarding conjunctival flaps, Smith says they are objectionable, because in making them you must cut the blood vessels of the conjunctiva and blood will gravitate into the anterior chamber. This accounts for some of the dark spots observed in the pupil space after the Smith operation. Smith avoids these by making the section entirely within the cornea.

Regarding Dr. Sherman's remarks they are certainly earnest and from a man of much experience and keen observation, and yet we all see cases in which the old operation is not to be attempted at all. A man consulted me today on account of his inability to pursue his occupation because of poor vision. He is 67 years of age, is in perfect physical health otherwise and wants to see and carry on his work in order to support his family. He can count fingers at four feet, but cannot see well enough to do his work. He has dense nuclear cataracts with a considerable amount of live lens fibers surrounding the nucleus. He has been told to wait until his cataracts become ripe. Is it necessary for him to wait from two or five years longer? I say "no"; he can be operated on at once with every promise of restoration of vision by Smith's method.

Regarding Kilkelly's reports brought up by Dr. Reeve, I would like to defend Smith in that matter, but Smith is well able to take care of himself, and you will find ample proof that Smith is the victim of petty jealousy and unfair treatment by his own countrymen. It is not unusual for men to decry the work of others practicing in the same country. It is true, however, that those who go about operating cannot control the cases afterward and the results will be far worse than if the cases continued under their own supervision. Of the 23 cases operated on by Smith at Bombay, there were only two or three in which any vitreous escaped. Kilkelly's report of the visual results of these cases is almost unbelievable. They were done smoothly and at least 20 had no loss of vitreous. It is reprehensible that the man in whose hands they were left reports such results, results that in my mind should be charged to him and not to Smith. It is the "meddlesome Matties" left behind to take care of these cases that ruin the results by constant peeping and testing.

The chair would say that after hearing Dr. Vail's paper and seeing his pictures, he feels that he has been saved the expense of a trip to Jullundur.

Dr. Greene (closing):—Dr. Reeve has referred to the twenty-three cases operated by Major Smith at Bombay, February, 1909.

(1), of which Major Kilkelly has furnished the statistics. While at Jullundur in November, 1909, Major Elliott of Madras first called our attention to them, so that we were familiar with the forth-coming publication of these cases months in advance. They are reported as follows:

No. of Cases	*Vision*
1	6.15
2	6.20
7	6.30
3	6.40
4	6.60
5	Fingers from 10 to 18 ft.
1	Moving Bodies
23	

To believe that Major Smith could operate on 23 cases of cataract and have the uniformly bad results just shown, is asking too much of men who have spent six weeks or more with Smith and have seen the high average results which he had, and which we ourselves have had under his direction. The fact that Major Smith performed these operations, pre-supposes they were properly made, and he has so stated (2) and with fair attention and proper after treatment should have done as well as the average of cases at Jullundur (3 & 4) Killkelly has tried to prove too much against the operation. If we grant that there is little time for testing visual results at Smith's clinic, 'it is also true that experienced operators who have spent enough time there to get a line on the complications liable to follow the operation, can know with reasonable certainty a good eye when they see one, without knowing exactly the lens required and the amount of vision obtainable. His statistics except under the conditions which I shall name later, cannot be accepted by any one at all familiar with the results obtained at Jullundur. The only condition under which such statistics can be received among those who understand the situation there is that contributory negligence wittingly or unwittingly given the cases was responsible for their poor showing. No other Indian operator with whose writings and statistics I am familiar, even though not favorable to the operation, has ever presented such an array of statistics against it, and I myself without ever having seen the operation performed by any one, and with nothing more than Smith's paper (1) to guide me, I made twenty-two operations which were recorded in the Transactions of this Society for 1906, page 70. This work of a novice is so much better in visual results than that reported by Kilkelly, and as the number of operations is practically the same in each case,

1. Kilkelly, Indian Medical Gazette, May, 1910, p. 178.
2. Smith Indian Medical Gazette, July, 1910, p. 249.
3. Smith Arch. of Ophth., Vol. 34, p. 602.
4. Lister Trans. Bombay Med. Cong., February, 1909, and Arch. of Ophthal., Vol. XXXIX, No. 1, p. 1.
1. Smith Arch. of Ophthal, Vol. 34 ,p. 601.

it may be of interest to compart them. He has reported that vision in 17 of these cases averaged 13/68, slightly better than one-fifth of normal. Vision in five cases equalled counting figures from 10 to 18 ft. and in one vision only equalled moving bodies.

Of my 22 operations, fifteen were given glasses. These had an average vision of 4/10 +, or 2/5 +, practically one-half of normal vision. Of the other seven cases one died of hypostatic pneumonia on the third day. One lost sight from fulminating glaucoma on the ninth day. One had vision equal to P. L. from occlusion and seclusion of the pupil. One had P. L. from thick capsule and three were not tested in time for the report.

I wish to state in regard to the effect of cocaine on the cornea, which has been referred to in the discussion, that I have on file in the library, of the Surgeon's office at the Soldiers' Home, a book kept by my assistants in which are recorded all the operations I have made in the hospital from my appointment on the staff to the present time. The first time I ever used cocaine I had a collapse or umblication of the cornea, and I had a note made of the fact. The condition of the cornea might be due to the use of cocaine. I think this is one of the original operations on the subject.

It is not worth while to say anything more about the technic of the Smith operation. I believe, however, I should say that I do not regard the operation as suitable for all cases of cataract. I do not employ it in all cases myself, and would not advise others to do so. It is possible to make a selection of cases of different kinds of cataract which will favor the operation and the statistics of the operator. For example, as I said in the paper, if you have a cornea of a horizontal diameter of 11/mm or more you can express the lens in the capsule with ease. In the chapter I am writing for Dr. Wood's Ophthalmic Operation, I discuss fully the section and the corneal-lens measurements just referred to. Smooth and easy delivery of the lens is the **sine qua non** of success in the operation. You cannot safely crowd a large body through a small opening. The section that is possible to obtain with safety in a 9 1/2 m/m cornea is too small for the average lens in the capsule to pass through, therefore this horizontal measurement of the cornea is a contraindication for the operation.

The trouble with many men who discuss this subject is that they seem to think the question of the future of the cataract operation is settled, so far as the old operation is concerned, it having been extensively practiced since 1753 (now 146 years,) has probably reached its limit of improvement in technic and visual results. But there are men who regard the future of cataract operating still an open question, and with the hope and possibility of attaining the ideal operation, are not satisfied to stop and throw up their hands. They believe that Major Smith offered us reasonably safe and practical series of manipulations, (1) by which the lens can be delivered in the capsule with a high degree of success, **if we are willing to master them.** I happen to have had excellent

1. Smith, The Treatment of Cataract, Calcutta, 1910.

facilities for acquiring some skill and technic in performing the operation, which I have used to the best of my ability. And to gain further proficiency in the method, have made the journey to India, where I operated about 400 times under Smith's direct supervision.

I think the great field of usefulness of the Smith operation will ultimately be found in the treatment of immature cataract. This I think is self-evident, but much can be said in its favor in the treatment of all kinds of cataract.

I appreciate all Dr. Jackson has said in regard to the operation. He has honored me with a visit to my clinics, and has seen the operation performed there, and has examined many operated cases so that he is in a position to speak on Intra-capsular extraction with some knowledge of the subject. I do not think every man should attempt it, and no man should follow the method unless he has had great experience in cataract operating which he cannot gain in less than one to two hundred operations. This does not mean that many of the men in this room could not become as expert as Smith himself if they had the same number of operations to perform, but it does mean that cataract is so comparatively rare in America, that very few men have the opportunity to become proficient in the operation by keeping in practice, after having learned to perform it. Therefore I will say again, at the risk of having my motive misunderstood, that no man can do this operation as a routine practice unless he has mastered its details and had a large operating experience under the guidance of one capable of demonstrating its technic, its indications, and contra-indications, and perhaps of as great importance as these, the care and after treatment of operated cases.

Dr. Reeve, (gaining the privilege of the floor):—I wish to say that I quote from reputable journals, the extract from an Indian medical journal, with a judicial frame of mind towards the Smith operation.

PROGRESSIVE, PRIMARY (?) ATROPHY, AND ALMOST COMPLETE DISAPPEARANCE OF THE RIGHT IRIS.

Casey A. Wood, M. D.

CHICAGO, ILL.

The case I am about to report has its chief interest in its extreme rarity, and the fact that there seems to be no adequate cause for the peculiar conditions about to be described.

W. R. T——, aged 44, in apparently robust health consulted me September 25th, 1907, for a progressive disease of the right eye, which he had first noticed, quite accidentally, about three and a half years before.

On inquiring into the patient's history, I found that none of his ancestors had any serious disease of the visual apparatus, and that he himself had not had any difficulty attendant on the use of his eyes, except the usual presbyopia, for which glasses had recently been ordered. Moreover, his general health, so far as he knew had been perfect. In the fall of 1891, that is, some sixteen years ago, during a football game, he had a collision with a fellow-player's head and sustained a fracture of the right superior maxilla, the break extending through the lower orbital margin. The patient says that there was overlapping (?) of the bones, but that no operation was done for the relief of this condition. Tingling and numbness of the right cheek continued for some weeks after the injury, and finally disappeared.

More recently (in the autumn of 1907 and January, 1908), the patient, however, had two attacks of swelling in the right side of his face, with pain and some discharge from the nose. These attacks lasted for several weeks and were accompanied by painful mastication and soreness at the infraorbital region. The swelling affected the lower lid and extended to the inner canthus.

For relief of this condition my *confrere*, Dr. Frank Brawley, did an antral puncture on the right side, and irrigated the cavity of Highmore. About an ounce of yellow-green pus was discharged, with relief from the pain and all other symptoms. A drainage tube was then inserted in the antral cavity, and the sinus was shortly normal again. In Dr. Brawley's opinion, the disease of the antrum was the result of an attack of influenza and not of the orginal injury.

With this exception, the patient, who has been principal of a private school and has been engaged in teaching for many years, shows on careful and repeated examinations of his internal organs, no organic lesion, nor is there a history of any dyscrasia whatever.

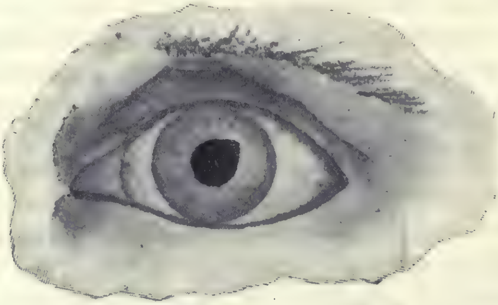
The important factor in the case, however, lies in the appearance of the right pupil. It so happens that the patient is a fair artist, and, partly from memory and partly from sketches made at the time, has drawn for me the appearance of the right eye (iris and pupil especially), at intervals since the disease was first noticed (Fig. 1). He reports that with the exception of some photophobia (for which he wore smoked glasses on occasions), he has never had any pain or any particular discomfort in the affected eye, although the pupil has been slowly getting larger, and the iris gradually disappearing ever since the lesion was first noticed.

Together with my assistant, Dr. A. N. Murray, I have watched the patient at fairly regular intervals for more than a year since September, 1907, and have witnessed a steady, progressive, and rather irregular disappearance of the iris tissues, unaccompanied by any symptom. Apart from the abnormal condition itself, the only sign that has been noticeable is the *increased tension* in the right eye. Vision during that time continued to be 20/50 *minus*, and the patient readily read Jaeger 1 with his glasses, and he had a normal range of accommodation. The ophthalmoscope showed absolutely no variations from normal. The defective distance vision was due to a compound hypermetropic astigmia, which, when corrected, gives the patient almost as good central sight as he obtained in the left eye, which is emmetropic and is in all other respects normal. Under ordinary circumstances he had usually read three hours at a time without any asthenopic difficulties.

For the purpose of deciding the effects of mydriatics and myotics on the right eye, homatropin and cocain were carefully instilled on three occasions, without increasing the size of the pupil and without raising the tension of the eye, although it has the usual effect on the accommodation. On the other hand, the continued use of eserin and massage did not materially lower the tension and had little or no effect in reducing the size of the pupil.

In the beginning of 1909, fully five-sixths of the iris tissue had disappeared, and the pupil had assumed the shape of an irregular triangle, whose angles reached almost to the root of the iris, in which situation all the iris layers have become absorbed (Fig. 2).

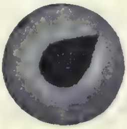
On examining the anterior layers of the iris with the corneal microscope, it is seen that the depth of the iris tissue varies considerably. It seems to be abnormally pitted here and there, while, except at its margins, the posterior uveal layer is apparently undisturbed. With



March 1904.

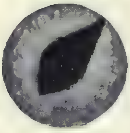
Fig. 1.

Fig. 2.



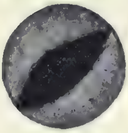
October 1904.

Fig. 3.



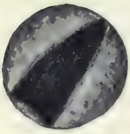
February 1905.

Fig. 4.



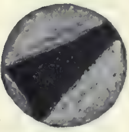
November 1905.

Fig. 5.



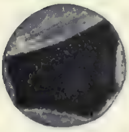
May 1906.

Fig. 6.



December 1906.

Fig. 7.



June 1907.

the Würdemann transilluminator, no part of the iris remnant is translucent, as might have been expected from the enormous amount of irregular atrophy. In other words, absorption of the iris tissue seems to have begun on the anterior surface and to have proceeded irregularly there, while the pigment layer has undergone absorption chiefly, or only, at the pupillary edge. This supposition is the more probable since the patient has light-blue eyes, and consequently a smaller amount of pigment is scattered throughout the anterior layers. At the end of January, 1908, it was found that the nasal segment of the iris responded slightly to bright light, but this reaction did not persist long.

The increased tension in the affected eye has not at any time been marked, and it has not greatly varied in degree until recently.

Let me add that the fields of vision, frequently measured during a period of nearly two years, remained uncontracted for both white and colors.

I now saw the patient less frequently, but witnessed, still, the slow progress of the atrophy and the increase in the glaucoma. The tension rose, the usual glaucomatous contraction of the periphery of the field set in, the ophthalmoscope showed occasional pulsation of the retinal arteries—always when pressure was made on the eyeball—and the patient had attacks of ciliary congestion, with asthenopia, pain, and blurred vision.

In spite of a cyclodialysis, massage with eserine ointment, pilocarpine sweats, etc., all of which gave temporary relief to the glaucomaeous attacks, the central vision continued to fall, and finally, there remained in the right eye only perception of light.

The patient, at the end of 1909, removed to Florida, and there consulted my friend, Dr. Louis A. Bize, of Tampa, to whom I am indebted for further notes of the case. On November 12th, 1909, he reported to me, that "the eye has been painful, congested, and inflamed for two or three weeks; worse the last week; no perception of light; tension not less than $+2$; only a small ring of the right iris remaining; lens opaque, cornea anæsthetic. Impossible to see the fundus on account of the lenticular condition. Vision in other eye with correction, 20/15, Jaeger I. Patient stated that he had noted vision in the better eye was not as good for close work as it had been. Advised enucleation of the right eye. He had to return home for a few days, during which time I had him try to relieve the inflammatory condition. This he did with eserine, hot applications, salines, daily sweats, and aspirin. He returned on the third day considerably improved. I removed the eye, preserved it in formalin and gave it to the patient to send to you to complete your examination of it. I might add that he now finds his vision clearer for close work."

Pathological Examination of Affected Eye

The eyeball so kindly sent me by Dr. Bize was given to Dr. Francis Lane, pathologist to the Illinois Eye and Ear Infirmary, for inspection, and I here append his complete report of the gross and microscopical findings:

"Specimen P. 335, furnished by Dr. Casey A. Wood, was fixed in formalin 4 per cent.

Gross findings.—Right eye, 22 by 23 by 21 mm., scleral curvature flattened above. Corneal surface very irregular, made especially so by a slightly depressed 1 mm. wide groove, oval horizontally ¾ mm. from centre. With exception of area 2.3 mm. wide, bordering limbus, the cornea is densely opaque. Root of iris indistinctly visible.

Coronal Section.—Vitreous filled with semi-fluid, gray-coloured exudate which hides all details. By transmitted light pupil slightly irregular, but in general oval-shaped, with long axis 9 mm. in horizontal and 7 mm. in vertical meridian. Optic nerve 4 mm. long. Anterior half sectioned vertically, outer segment blocked. Posterior half sectioned horizontally. Upper segment blocked. Fifty (50) serial sections, 25 *microns* thick, made of both anterior and posterior segments, every tenth specimen being stained with Delafield's hæmatoxylin and eosin.

Anterior 23 and posterior 22 and 23 are van Gieson stained specimens.

Eighty-five (85) serial sections made from optic nerve, every tenth stained with Dalafield's hæmatoxylin and eosin, while numbers 22, 32, 43, 52, 62, 72 and 82 were stained with van Gieson.

Anatomical description.—Marked wrinkling of all corneal layers. Epithelial surface extremely wavy. Scattered vacuolated epithelial cells in superior layers. *Ingrowth of vascular granulation tissue from the limbus.* Beneath thickened and somewhat keratosed epithelium, Bowman's membrane and anterior lamellæ destroyed in the area of infiltration. Surrounding the plexus of dilated fine vessels, many round and spindle cells. Few deep-lying vessels near limbus. Anterior chamber shallow and almost completely filled with albuminous and fibrinous transudate. *On posterior corneal surface are several areas of fine network of fibrin, in the meshes of which are pigment-bearing wandering cells,* surrounded with fine free pigment granules. Under the precipitates areas are found where endothelial cells have disappeared.

The angle of the anterior chamber completely obliterated by broad fusion of the peripheral part of the iris to the posterior surface of cornea. The corresponding deep layers of the cornea infiltrated, most marked round Schlemm's canal. Canal patent in every specimen, except in + 14, where complete obliteration has taken place on one side only.

Apposed to the corneo-sclera, the iris root is atrophic. In + 14, the root reduced to thin film, behind which the retinal pigment has disappeared. *Pigment has migrated into corneal and fibrous tissue in neighborhood of false angle.* Pupil 6½ mm. wide. The pupillary border of iris pulled forward and outward. On one side anterior surface completely bent upon itself, to such an extent that in +14 the retinal pigment is dragged outward to the false angle of the anterior chamber, and actually bounds the posterior and outer wall of the latter, so that only back surface of iris faces cornea. On opposite side same distortion, but much less so, showing, however, that sphincter takes part in the ectropion and appears hook-shaped. Iris uniformly degenerated, and thinned, particularly on side of extensive ectropion, where its spongy nature has completely disappeared and been replaced by more dense connective tissue (shown by van Gieson) and clumps of pigment. Iris vessels have thick walls encroaching upon their lumens, several warty excrescences of pigment bearing cells on anterior surface of iris. Specimen +34 shows clumps of deep pigment adherent to posterior corneal surface anterior to ectropic pupillary hook, as if iris had been opposed to corneal endothelium.

Posterior chamber partially filled with albuminous transudate free from cells. Muscle bundles thinner than normal, the processes are shrunken and flattened. In the apices of processes are found subepithelial vesicles of albuminous transudate (recently described by Schirmer as indicative of chronic irido-cyclitis).

Large wide fissures separate peripheral lens fibres. Many eosin stained Morgagnian globules found in the midst of broken-down cortical fibres. Near anterior pole, clump of cells deposited on thinned anterior capsule, behind which cubical cells proliferated to four layers and neighboring fibres are broken up. Lens nucleus for most part stains with hæmatoxylin.

For short distance on both sides of disc, Haller's vessels overdistended. For most part choriod markedly compressed. Many spaces in ganglionic cell layer corresponding to size and shape of multi-polar cells. Scattered areas of cystic degeneration.

Bowl-shaped regression of lamina cribrosa. Sclera bounds lateral walls of excavated cupping. Marked interstitial optic neuritis, evidenced by extensive proliferation of glia and pia throughout nerve trunk and on surface of cupped disc. Anterior to lamina, many minute holes (Schnabel's cavernous atrophy).

Serial sections of optic nerve show extensive vascular degeneration of the central artery. +51 shows complete obliteration of vessel-lumen.

Anatomical diagnosis:—

I. Subacute and chronic fibrino-plastic irido-cyclitis.
II. Chronic secondary glaucoma.
III. Extensive secondary atrophy of entire iris (inflammatory and glaucomatous.)
IV. Vascular degeneration *arteria centralis nervi optici.*

Comments.

Although there can be no doubt about the extreme rarity of these cases of progressive atrophy of *all* the layers of the iris, the few instances that are recorded in medical literature form a fairly well-defined group—so far as the symptomatology is concerned. The patient finds by accident that his iris is disappearing. The surgeon whom he consults, sooner or later, discovers signs of glaucoma, the patient eventually complains of some of the symptoms of that affection, and between the two observers a fine-spun theory regarding the cause of the mysterious disease is evolved.

Disregarding examples of atrophy of the anterior layers, or simply shrinking of the whole organ without entire disappearance of any considerable portion, I wish to refer to three cases that closely resemble my own. Of course, I have neglected cases of atrophy plainly due to traumatism or infectious cyclitis, as well as those conditions following a long-standing or absolute glaucoma.

G. Lindsay Johnson* reports a case of progressive atrophy of the left iris. The right eye had been excised many years previously for a serious injury to the globe. Otherwise the patient has always been healthy. Two years before he was seen by Johnson, the sight of the remaining eye began to fail, and his friends noticed that the pupil grew larger. For seven months Johnson watched the progress of the atrophy, and at the time of writing only a small band of iris, above and below, remained. Vision was very imperfect, and could not be improved by lenses beyond J. 5 and 20/50. The optic disc and macula were unaffected, and the fundus immediately around was healthy; elsewhere there was general atrophy of the choroid. The author offers no explanation of the phenomena, and says nothing about the tension of the globe or the extent of the visual fields.

Harms† gives a most interesting account of a spontaneous, unilateral atrophy of the iris, which closely resembles my own case. I have had reproduced a picture of the atrophied iris in this instance.

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*JOHNSON—"Atrophy of the Iris." Ophthalmic Review. Vol. V 1886, p. 57.

†HARMS.—Atrophy of the iris without mechanical injury. (Einseitige spontane Lückenbildung der Iris durch Atrophie ohne Mechanische Zerung). Klin. Monatsbl. f. Augenheilk., Nov.-Dez., 1903, S. 522

The patient was a strong, healthy man, whose general condition was practically normal and threw no light on the cause of the atrophy. His refractive error was insignificant, and when seen by Harms, he had a well-marked simple chronic glaucoma.

In justification of the words "primary" and "spontaneous" employed in the titles of our papers, I agree with Harms in thinking that it is quite possible, if our patients had been seen early enough, before the iridic atrophy had much advanced, the eye *might* have been found without glaucomatous signs. In other words, I have an idea that the canal of Schlemm had very gradually closed before or after adhesion of the periphery of the iris to the posterior aspect of the cornea, and that the end-process is a quiet, secondary glaucoma. This theory is all the more probable since the history of both cases shows that for years the gradual disappearance of the iris was noticed without any other symptoms. Finally, if a simple, chronic glaucoma can alone bring about a result of this sort, why do we see so few of them?

Dupuy-Dutemps* believes that the peculiar, regular, marginal atrophy of the iris found in a case described by him as associated with tabes, is the result of some interference with the nutrition of the tissues, resulting from disordered innervation of the iris. Furthermore, the writer gives this explanation to account for iris alterations in other patients, similar to complete atrophy degenerations of that organ. There was no increase in the tension at the time of writing.

In the cases I have referred to, and in the history of my own patient, there is not the slightest evidence of the central nervous lesion. Consequently, I am forced to conclude (so far as one may, from the meagre evidence, come to any conclusion) that the so-called "idiopathic" or "spontaneous" atrophy of the iris has a varied pathogenesis. It is likely that every example of the disease will be found to exhibit towards the end of the process a more or less marked glaucoma, but this condition probably is, as I have said, only an incident in the progress of the disease. It arises during the efforts of the ocular drainage system to get rid of the irritating products of the primary disease, and is not an essential part of the atrophic degeneration. As shown in my own case, there was a definite migration of uveal pigment from the iris towards the sclero-iridian angle, the escape of the granules being prevented by the complete obliteration of the filtration area, due, doubtless to a low-grade, exudative, plastic iritis.

*DUPUY-DUTEMPS.—"Sur une forme spèciale d'atrophie de l'iris au cours du tabes et de la paralysie générale. See rapports avec l'irrégularité et les troubles réflexes de la pupille." Ann. d'Oculist., septembre, 1905, p. 190.

DISCUSSION.

Dr. Jackson:—I was fortunate enough to be in Chicago a few days after Dr. Wood first had seen this case, and he showed it to me. At that time, I do not recollect symptoms of glaucoma at all, but the changes of the iris were very striking. It seems to me that this atrophy is most nearly like what sometimes happens after a serious injury to the eye in children. I have seen cases in which there was extensive iris atrophy in such eyes; and sometimes traumatism results in extensive openings in the iris, false pupils. This case impressed me as more like that condition than any other I have ever seen.

Dr. Weyler:—According to the new theory of circulation of the iris this atrophy is what sometimes may happen, the equeous being absorbed and disintegrated in the anterior chamber. If this is proven, we will have to change our ideas about glaucoma and intra-ocular tension. If Dr. Hamberger's theory holds good that the anterior iris surface forms and absorbs the aqeous, would it not hold good in this case, that in the atrophy of the anterior layers of the iris we would have this glaucoma? The theory is interesting and well worthy of reading. It shows that we have been working on a falacy and that the former views were inaccurate. It shows it also by the administration internally of fluorescein, which has never been known to go through the black pupil, but is shown in the iris.

THE RELATION OF THE TRACHOMA BODIES TO TRACHOMA.

(WITH A REPORT OF CASES EXAMINED.)

HANFORD MCKEE, B. A., M. D.
MONTREAL, CAN.

Progress in diagnosis in diseases of the conjunctiva has been marked, during the last few years, thanks to the help of ophthalmic bacteriology. In spite of that, trachoma in some forms, seems as difficult of diagnosis today, as it was many years ago. One does not refer to the typical cases, with pannus and scar formation, but to the condition of ophthalmia where the palpebral conjunctiva is found thickened, succulent, and granular, all of which conditions are accentuated in the retrotarsal folds. Papillary hypertrophy is by no means limited to trachoma. The hypertrophied follicles are the result of the reaction of the conjunctiva to continued irritation, whether that be caused by micro-organisms, physical, mechanical, or chemical means. Many of these forms are not contagious, and in only a slight degree related to trachoma.

The diplo-bacillus of Morax-Axenfeld is able to set up a clinical condition identical as far as the conjunctiva is concerned, with trachoma. Likewise the pneumococcus sometimes gives a picture similar to the acute form. The relation between gonococcus infection and trachoma, may be closer than we think. As Axenfeld has said "the sequence in many cases is striking." Who can not recall cases of ophthalmia where the secretion was examined for days for the gonococcus, when only the subsidence of the discharge and the appearance of the granular condition lead to the proper diagnosis. We have all noted the granulations in the retro-tarsal folds in cases of gonorrhœal ophthalmia of some days standing, and noted the similarity to trachoma. These references suffice to emphasize the first point I wish to bring out, that in certain cases, in spite of the bacteriological advantages of today, only the subsequent course of the disease, affords us the desired information.

The discovery of the cause of trachoma will alone give us the means of differentiation. That only, will put the diagnosis on a definite basis, and settle the old question of trachoma and follicular conjunctivitis. The discovery of the etiological factor has been reported more than once. Generally these announcements have represented "wild flights of the investigators." Not so with the report of Halbersteadter and Prowazek, who in 1907 described inclusions which they had observed in the epithelial cells of the conjunctiva. After staining, with Giemsa, the smear preprations from a trachoma patient, they found near the nucleus of the epithelial cells, round or oval, dark blue or violet, non-homogeneous masses. Within these bodies, they found very sharply defined, small granules of a distinctly red colour. They also noted irregular masses of blue stain, the reaction product of the cell-plastin clots. Halbersteadter and Prowazek believed these small bodies parasites because:

(1) They were always found in the same charasteristic way.

(2) Inoculation on to the conjunctivæ of the orang-outang infected it with the production of these bodies in the epithelial cells, and transference from orang-outang to orang-outang was possible.

They suggested the name *Chlamybozoa*. Their findings have been verified from many quarters.

In this country, Pusey of Chicago, Verhoeff of Boston, and McKee of Montreal, have demonstrated these cell inclusions in trachoma.

There is no doubt that the Halbersteadter and Prowazek bodies are constant in all cases of fresh trachoma. Are they present in conditions other than trachoma? Before proceeding to the examination of the diseased conjunctiva, Herford examined 100 films of non-trachomatous cases with negative results. Stargardt reported having seen the bodies in one case of non-bacterial ophthalmia neonatorum, Lodato, in cases of spring catarrh, and Stanculeano in chalazion.

Heyman, in his study as to their specificity, reported that of nine positive cases, five were from acute trachoma, and four from gonorrhœal ophthalmia neonatorum. In these four cases the gonorrhœal nature of the disease was established and the possibility of infection with trachoma excluded. The bodies were so typical, that experienced microscopis's were unable to differentiate the inclusions seen in the ophthalmia neonatorum cases, and those supposed typical of trachoma. He therefore concluded that it was impossible to declare the Prowwazek bodies as specific for trachoma, and that their presence was of no value in diagnosis, unless every suspicion of gonorrhœa was removed.

Later, Flemming, among thirty-two cases of infantile conjunctivitis, observed for some months, found the trachoma bodies in twelve cases. He also demonstrated these inclusions from a case of gonorrhœal conjunctivitis in an adult.

Wolfrum examined twenty-eight cases of gonorrhœal ophthalmia, and obtained negative results. From eight cases of catarrhal conjunctivitis of the new born, four had inclusions. Secretion inoculated into an adult's conjunctiva was one week later followed by follicles, and after nine days, typical inclusions were found in the smear. The further course of the case was that of genuine trachoma. From these observations Wolfrum concluded that Heyman's findings were from mixed infections of trachoma and gonorrhœa, and that his own cases of catarrhal inflammation were trachoma of the new born, presenting a very different clinical picture from trachoma in the adult.

Linder and Holfstätter found trachoma bodies in the vagina mucous membrane, while Lindner and Fritsch demonstrated them in the inflamed male uretha.

Halbersteadter and Prowazek, following Heyman's report made similar examinations with regard to infantile ophthalmia. They concluded that there was a large group of non-gonorrhœal ophthalmia, characterised by the presence of Chlamydozoa, where the infection took place intra partum, which they looked upon as a special infectious disease, Chlamydozoa-blennorrhœa. They also found bodies in the genito-urinary tract of some of the mothers, and also in the urethra of males suffering from a non gonorrhoeal inflamation. In a former report they stated, that they believed the Chlamydozoa ophthalmia was in morphology, identical with that of trachoma, but that the two might be differentiated biologically. As Lindner and others have since produced typical experimental trachoma with vaginal secretions, they now believe that the origin of trachoma is derived from the epithelium of the genital sphere, and support Lindner's view that the disease of the conjunctiva, male urethra, and female genitals, are caused by one and the same virus.

Heyman, continuing his researches states that he has found the trachoma bodies only, in trachoma, in infantile conjunctivitis, and in a suspicious conjunctivitis in an adult female. He often found the bodies and gonococci in the same preparation. In fifteen cases of fresh trachoma the bodies were found in ten, in fifteen cases of relapses, the inclusions were found three times, while in twenty-three cases of old trachoma, no bodies were found. Of forty-three cases of infantile conjunctivitis, fourteen were pure gonorrhoeal inflammations, ten were inclusion conjunctivitis, with no pathogenic organisims, while twelve were *mixed blennorrhœas.* In fifteen examinations of the inflamed urethra in men and women, the trachoma bodies were found in two, while in controls, the examination was negative. Heyman offers nothing new as to the nature of these inclusions, but states that he believes the bodies point to the presence of a virus transmissable to apes, and to which the eyes of the new born are very susceptible.

During the past few months, I have made a hundred and fifty odd examinations at the Montreal General Hospital. The smears may be perpared, fixed and stained within one hour, making the examination in the out-patient department practical. I have had negative results in 3 cases of active trachoma.

13 cases of old trachoma with scar formation.
60 cases of catarrhal conjunctivitis.
28 normal eyes.
5 cases of gonorrhoeal ophthalmia neonatorum.
11 inflamed tonsils.
5 from the vaginal mucous membrane.

The trachoma bodies were found in:

14 cases of active trachoma.
1 catarrhal conjunctivitis, (pneumococcus) in an infant of ten days.
2 purulent conjunctivitis, in babies of two weeks.
2 infants with no conjunctivitis.
1 adult male with no conjunctivitis.

It will be noted that in three cases of active trachoma, we had negative results in the smear preparations. To show that the bodies may be present in the conjunctiva and missed in the smears, I may say that in one of these cases, examined every day for a week, no bodies were found, but were later demonstrated in the tissue preparations. A striking result of my examinations, was the finding of the trachoma bodies in the normal conjunctiva. That has been reported, and need not be dewlt upon here, except to say, that since this report, another such case in an infant has been observed. Of the postive results, one of great interest to me, was as follows: A baby of two weeks was brought to the out-patient department of the Montreal General Hospital, some three weeks ago. It had a purulent conjunctivitis of four days standing. Smear examination was negative, while culture showed the presence of the staphylococcus pyogenes albus and the bacillus xcrosis.

To verify the reports of others on infantile conjunctivitis, prepared smears were stained with Giemsa. The epithelial cells, were crowded, in many cases the cytoplasm of the cells was broken, by masses of trachoma bodies. The whole microscopic picture was a much more exaggerated one than I had ever seen in our most virulent trachoma cases.

The Halbersteadter and Prowazek trachoma bodies have been found by numerous observers in trachoma, in ophthalmia neonatorum, gonorrhœal, and bacterial, by a few in catarrhal and purulent conjunctivitis of infants, by myself in the normal eye. They have repeatedly been demonstrated from the male and female genital organs, to such an extent in fact, that Herzog would have us believe that gonococci involuted or changed in some other way are the producers of a disease as severe as is true trachoma. What the trachoma bodies are, only further unbiased research may show. In the light of our present knowledge, do they not seem to represent more the reaction of these different mucous membranes to some virus, rather than the etiological factor in trachoma. "For the present we must consider it doubtful whether these granules are parasitic in nature or not, and further research is necessary before we can say whether they occur so regularly in trachoma, that they can be considered of diagnostic value." This Axenfeld wrote in 1908, it seems to me that 1910 finds the question in statu quo.

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DISCUSSION.

Dr. Lewis, Buffalo, N. Y.:—The fact to which Dr. McKee calls attention, that free trachoma bodies have been found in a number of instances in de nova gonorrhoea in one form or another, leads me to say that there might be an inhibitory action in the gonorrhoeal serum. We have no true trachoma in the vicinity of Buffalo, but a case came to me and I had an opportunity to make a thorough examination, which is at least suggestive. After having used the ordinary copper sulphate and other treatment in an endeavor to control this case, and finding it not responding favorably, I sent to my friend Dr. Norman McCloud of Buffalo, and asked him to use the gonococcal serum, prepared experimentally, in the hope it would develop anti-bodies which would affect the developing trachoma. In this case the result was gratifying. Within three days, the acute inflammatory symptoms subsided and there has been definite improvement ever since. That it was actually trachoma there is no question. It had involved the edge of the cornea. Dr. McCloud, in making microscopical examination, was unable to find the trachoma bodies, and he thought that previous treatment had destroyed them. While this is a purely empirical suggestion and in no way demonstrative, it seems to me suggestive enough to make it worthy of mention here today.

Dr. H. H. Martin, Savannah, Ga.:—The Coover method of treating trachoma may be briefly described as follows: The lids are everted and the conjunctiva thoroughly scrubbed with sandpaper which has previously been sterilized by pouring alcohol over the surface, setting fire to the alcohol and allowing it to burn off. I had the pleasure of seeing Coover operate by this method in June 1909, prior to that time I had always operated for trachoma with Noyes forceps. I was much impressed with the sandpaper operation, but did not agree with Coover that the operation was sufficient in itself to cure this disease. My observation having been that copper-sulphate or some other specific for this disease is essential to complete a cure after any of the surgical measures.

In the late summer of the same year I discovered sixty cases of trachoma among ninety-eight boys, inmates of an orphan home near Savannah. I divided these sixty cases into four groups of fifteen each. The first fifteen were treated after Coover's method unmodified, the remaining forty-five were treated after the Coover method modified as follows: Instead of burning alcohol or making any other attempt to sterilize the sandpaper I used the sandpaper just as it came from the shop, but immediately after the operation the conjunctival sac was copiously irrigated with normal salt solution in order to clear the sac of any loose grains of sand; the lids were then everted and thoroughly scrubbed with gauze sponges and a one to five-thousand bichloride solution (this was done also in the first fifteen). In the entire sixty cases there was no evidence of infection having occurred during the operation. I am convinced therefore that any attempt to sterilize the sandpaper is troublesome, unsatisfactory and entirely unnecessary. Immediately after the operation the patients were kept in bed until they had recovered from the anesthetic, but no dressings or local applications were used. In every instance the boys were in their places in the school room the next day after the operation.

The first group of fifteen had no after treatment of any description. In the remaining forty-five a saturated solution of copper-sulphate (40 grains to the ounce) was dropped into each eye once a day for eight weeks. Ten months after the completion of this series of operations these sixty cases were all carefully examined for trachoma with the following results: In the fifteen cases which were treated strictly by the Coover method without after treatment there were twelve recurrences (80 percent). In the forty-five cases where the copper-sulphate was used as above described there were but six recurrences (13 percent). I wish to explain also in this connection that these operations were all done in the dormitory of the orphan home, no operating-room being available, and that the after treatment was carried out by very inexperienced attendants.

Had the after treatment been carefully and thoroughly carried out, there is every reason to believe that there would hav been no recurrences in those cases in which the copper-sulphate was employed after operations.

SUMMARY.

The scrubbing out of the granulations with sandpaper (No. 00 or 0) is by far the most satisfactory operative procedure yet devised in the treatment of trachoma. No operative procedure is sufficient in itself to cure this disease. All of them should be followed up for from four to eight weeks with some specific treatment, a saturated solution of copper-sulphate being the most satisfactory in my experience. If the conjunctival surface be thoroughly flushed with a normal salt solution and scrubbed with a one to five-thousand bichloride solution after the completion of the operation, sterilization of the sandpaper is entirely unnecessary. Any narrow blade thumb forceps will serve for averting the lids, the time consumed in operating averaged one hour and a half for each fifteen cases, two anesthetists and two nurses assisting.

PARINAUD'S CONJUNCTIVITIS.

WITH REPORT OF A CASE.

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Parinaud's Conjunctivitis, so called because discovered and described, in 1889, by Parinaud of Paris, is a rare disease. To date but sixty cases, or thereabouts, have been reported in ophthalmological literature. Goldzieher reported a case in 1882, which he called lymphadenitis conjunctivae, the symptoms of which correspond to the symptoms of the affection under discussion. However in his subsequent writings upon the disease under discussion he does not classify it with the cases of Parinaud's disease observed by him.

Definition.—A self-limited, unilateral, infectious inflammation of the eyelids, with the formation of large ploypoid granulations on the conjuntival surfaces thereof, together with marked swelling of the glands of that side of the face and neck.

Cause.—Parinaud believes it to be due to animal origin. This view is not shared by such observers as Gifford. However, K. Hoor (Monatsbl. f. Augenheilk. 1906, Apr.-May) in an article dealing with the forty-four cases reported to that date, believes that in two-thirds of them there was opportunity for animal infection. One of Barck's cases was a telegraph operator with no such opportunity for infection. David Webster (Medical Times, June 1909) from his case, a young lady, does not believe the disease to be of animal origin.

The disease has been observed only in the temperate zones and most frequently in the autumn time.

The sexes are affected about equally.

It is liable to occur at any age. The youngest case on record is that of Schoeler, (Centralbl. f. prakt. Augenheilk. 1906, S. 362), the patient being one and one-half years of age. The oldest is sixty-one. Seventy percent of the cases occur under twenty-six years of age.

The right eye is more frequently affected because people, as a rule are right-handed and hence carry the contagion thus.

Pathological Anatomy.—As to the gross anatomy, we are confronted with a marked swelling of the eyelids of one eye, so marked as to close them together. From between the eyelids exudes a mucopurulent discharge which is usually slight in quantity or at most but moderately profuse. If profuse, it rapidly becomes scanty. The swelling of the glands is quite characteristic, beginning with the preauricular gland and extending downward and involving the submaxillary, parotid and cervical glands. In a case reported by Barck (Trans., Am. Acad. Ophthal. et Oto-Laryng., 1908, p. 196) the preauricular was seperated from the submaxillary and cervical glands, each being as large as an apple.*

Eversion of the eyelids shows a characteristic swelling of the underlying conjunctiva into large granulations which are polypoid in character. Sometimes these are found on the ocular conjunctiva, though rarely. The cornea is but rarely involved. The case to be later reported in this paper showed corneal involvment. The only other cases showing such involvment are reported by Rohmer (Annal. d. Ocul. 1894, T iii, p. 360) and Basserres-Poujol (Ann. d. Occul. XXXIX, p. 161.

Microscopically.—Morax and Manouelian (Recueil d' Ophthal. Nov. 1903) made an examination of the case of Chaillous and Toufesco, by taking bits of the tissue of the affected conjunctival membrane and found the "subepithelial zone of diffuse infiltration quite different from the infiltration of trachoma, and an absence of the giant cells and bacilli of tuberculosis."

Verhoeff and Derby (Arch. Ophth. July 1904), thoroughly investigated this disease and found the cellular infiltration to consist of phagocytic and lymphoid cells with marked cellular necrosis. The lesion is superficial. Goldzieher (Centralb. f. prakt. Augenheilk. Jan. 1905) finds the "excrescences consist of a netlike tissue in a condition of high grade edema and differs from trachoma in the absence of round cells, which form the trachoma follicles. In both conditions the surface epithelium tends to proliferate, but in trachoma it forms narrow fungi-like processes, the trachoma glands; while in lymphom-conjunctivitis it penetrates in irregular masses, and the cells show a tendency to mucoid degeneration." Reis (Graefe Arch. f. Ophthal. S. 46, 1906) disagrees with Verhoeff and Derby, quoted above, in that he does not find the subconjunctival tissue in a state of necrosis. However, Sinclair and Shennen (Trans. Ophthal. U. King. Vol. XXVIII.) in reporting a case, confirm practically the observations of Verhoeff and Derby in that they find "the formation and the subepitheial tissue of a variety of granulation tissue, crowded with cells and containing numerous young blood vessels. There were also alterations in the epithelium, with superficial erosions and minute areas of necrosis in the deeper tissues.

The tarsus was found normal by Bernheimer, after its removal for the cure of a case of his, (Klin. Monatsbl. f. Augenheilk. 1806, S. 253).

*The preauricular gland in Barck's case showed fluctuation. An opening into it brought forth only a small amount of pus, which was surrounded by broken down tissue.

Gifford (Tran. West. Ophthal. and Oto-Laryng-Soc. 1898) believes "that the infection starts with the formation of a greater or less number of small abscesses in or below the conjunctiva. In this stage the patient is seldom or perhaps has never yet been seen. When the abscesses break the discharge becomes profuse for a short time, and in most cases large granulations develop from the edges of some of the ulcerations or the small fistular left by the abscess."

While histologically it resembles tuberculosis in many points, yet it is not tuberculosis in origin. The tubercle bacillus cannot be found and inoculation experiments are failures.

Bacteriologically.—To date the examination of tissue and discharge for a specific bacterium, as a probable cause has been fruitless; and, as Alt remarks after the examination of a case of Barck's (Trans. Am. Acad. Ophthal. and Oto-Laryng. 1908) "I was absolutely unable to stain any particular organism. If there is one it is too small to be seen by our present means." Often the staphyococcus and B. Xerosis are found. The streptococcus has been found by Rohmer (Annal. d'Occulist. 1894, p. 360) and Villeneuve (Theses de Paris, 1896, p. 95).

Gifford reports that in an examination made in three of his cases nothing was found but what was of secondary importance.

Stirling and McCrea (Montreal Medical Journal, Vol. XXIII, 575) report finding a bacillus resembling the Klebs-Loeffler bacillus. This was found for twenty-five days while the patient was under active treatment. The impression received by these investigators was that they were dealing with a less toxic form of the diphtheria bacillus or with a virulent form of the xerosis rosae bacillus is recognized as inocuous in the eye.

Kornel-Scholtz (Arch. f. Augenheilk. LIII, Ht. 1, p. 40) reporting a case resembling this disease, isolated what he believes to be the specific organism. Cultures made from nodules showed a small bacillus four times from five cultures. It was from 0.5 to 1.5 microns long and in chains of fives and sixes. They were negative to Gram. He also found it in smears from the lymph glands, though he could not cultivate them on the various media. It was pathogenic for mice and chickens. The corneae of guinea pigs inoculated with the germ showed a diffuse opacity which cleared in a few days. According to Axenfeld, the bacillus was very like the B. Gallinorum, and belonged to the group of the polar staining bacteria, like plague and hemmorrhagic septicaemia.

Awerbach (Western Ophthal. Jan. 1909) found the pneumococcus from the pus of a large preauricular gland. He considered infection from animals doubtful. He regards the necrotic areas of Verhoeff and Derby, and the plasma cells of Matys of no special significance.

Claiborne (Arch. Ophthal. 1905, p. 82) in the report of a case could find only staphylococcus pyogenes aureus.

Inoculation experiments were made on rabbits by Gourfein (Rev. Gen. d'Ophthal. Feb. 1907), and Sinclair and Shennen (Trans. Ophthal. Soc. U. King., XXVII, p. 39, 1907) with negative results. The staphylococcus was the only organism recognized. The same writers in reporting another case in Vol. XXVIII of the same Transactions, found two varieties of the white staphylococci from the necrotic areas of the conjunctiva, while from the glands of the neck were isolated staphylococcus albus and aureus. From a sinus was obtained the streptococcus.

Barck (Ophthal. Rec. 1909, p. 374) reports a case seen Dec. 21, 1908, which he submitted to microscopic examination as to the excised follicles and smears. The results were negative in all respects as to the presence of any specific bacterium.

From the evidence at our command to the present time we are forced to the conclusion, at least, that if the disease is due to a bacterium, our present means of diagnosis are inadequate. That it is due to infection, there can be no doubt. That it is contagious is very doubtful.

Symptomatology.—In ordinary forms the patient's appearance is quite marked. The eyelids are markedly swollen and at first sight the appearance is not unlike that present in gonnorheal ophthalmia. However the pus characteristic of that disease is wanting, and smears made thereform do not show the gonoccoccus of Neisser. The swelling takes place suddenly, and the discharge from between the eyelids is at first profuse but rapidly becomes scanty. Eversion of the eyelids shows the conjunctiva thereof to be the seat of a very large granulations. These may be polypoid in character and pedunculated. There may be superficial greyish ulcers present between the granulations. This condition of affairs may extend itself on to the ocular conjunctiva as well.

The cornea is usually unaffected, though in the case to be reported by the writer, such on affection took place, and healed so that its site shows but very little of the former trouble. The corneal trouble looked like the shedding of the epithelium over about one-sixth of its lower portion and was not stained with fluorescein solution. It presented none of the appearances seen in the ordinary corneal ulcer. Similar appearances have been recorded by at least two other observers, as quoted above.

The disease manifests itself by marked swelling of the glands of the face and neck of that side. In my own case that swelling was very marked in the preauricular gland as well as in the parotid, submaxillary and superficial glands of the neck. The glands seemingly would go on to suppuration, but that condition of affairs is very rare indeed judging from the published cases. The glands are liable to be very tender on pressure. The adenopathy is liable to precede the conjunctival lesion as in a case reported by Gourfein (Revue d'Ophthal. Feb. 28, 1907).

The ocular conjunctiva frequently shows chemosis as in the writer's case.

While it is the rule for the disease to be unilateral, yet Chaillous and Tufesco (Recueil d'Ophthal. Nov. 1903) reported a case where the disease was bilateral, both eyes being affected. Parinaud saw the case and concurred in the diagnosis thereof.

The temperature is usually above normal, never exceeding 101 degrees and then only for a day or two. It gradually declines and in a week or two it becomes normal.

As to the symptomatology, Gifford suggests two classes may be differentiated, one with granulations resembling those of trachoma, and the more numerous cases in which polypoid character of the granulations is present.

Diagnosis.—The disease is to be differentiated from trachoma and tuberculosis. From trachoma, it may easily be done because this disease is unilateral, while in trachoma both eyes are usually affected. Moreover, in trachoma involvent of the lymphatics does not take place. The cornea is very seldom involved in this disease whereas in trachoma the reverse is the case. Then, too, Parinaud's disease yields readily to treatment for so severe a disease, while trachoma is liable to be a very rebellious trouble to treat. Pannus is very frequently seen in trachoma, but not in Parinaud's disease.

From Tuberculosis.—Axenfeld in his work "Bacteriology of the Eye," well sums up the situation in the following words—" In spite of the many points of histological resemblance, it cannot be said that tuberculosis is a likely cause of Parinaud's conjunctivitis. Every inoculation has failed, and search for the bacillus tuberculosis has also been unsuccessful."

From Syphilis.—There is no subsequent skin eruption, neither suppuration of enlarged glands, nor induration of the eyelids and the absence of these signs serve to differentiate this disease from syphilis.

From lymphoma of the conjunctiva of adults.—Pardinaud's disease differs both clinically and histologically.

Prognosis.—The disease is self-limited and tends to get well of itself, in from two to six months. So far no cases have been reported in which material damage to eyesight resulted. In the writer's case the duration of the disease was three and one-half monhts, and though the cornea was affected, the area of affection was below the pupil and no damage to vision resulted. So far from the cases reported, we seem to be justified in telling patients that their prospect for perfect recovery is good. All reports concur that the eyelids are restored to a normal condition. The adenopathy disappears and leaves no trace of its former trouble. To date no recurrences have been reported. It is to be confidently hoped that one attack will immunize against like trouble in the future.

Treatment.—Parinaud recommends the use of nitrate of silver in solution. In Gifford's cases he used sulphate of copper and a two percent solution of nitrate of silver. His opinion is that, where the granulations are few, to clip them off and to cauterize any ulcerations that may exist. Goldzieher believes in cutting off the granulations, checking the hemorrhage with the galvano-cautery, using a one percent (?) solution of bichloride of mercury, and the internal administration of iron and arsenic. Griffin in his case removed the granulations by scissors and applied at the same time a twenty-five percent solution of nitrate of silver. Bernheimer in his case after a prolonged treatment and fearing permanent damage to his patient's cornea, excised completely the effected conjunctiva, and the underlying tarsus, which as noted above he found to be normal. After five months his patient left the hospital cured, but with the cornea affected. Gourfein treated his case with applications of a two percent solution of nitrate of silver applied to the eyelids, everted, also hot applications to the eyelids, and likewise to the swollen glands. Internally he gave cod-liver oil. Cure was effected in a little over two weeks. Jocqs secured results with the galvano-cautery. Shoemaker found a one percent solution of nitrate of silver sufficient for his case. Dehenne and Bailliart secured rapid recovery in their cases by "thorough washing out of the diseased conjunctiva with a solution of cyanide of mercury1:10,000; massage with a one percent yellow ointment daily, and lightly cauterizing the granulomata with a two percent solution of silver nirate." Barck in reporting his case states "all the excrescences were removed with scissors and a number of the yellow infiltrates were punctured and afterwards squeezed out with the trachoma forceps. There was hardly any reaction. The remainder of the yellow infiltrates were treated in the same manner one week later. The improvement was a very rapid one. After the surgical treatment, daily applications with a one percent solution of sulphate of copper were made. Internally the patient was given arsenic and iron. In Webster's case, bandaging the eye favorably influenced the course of the disease.

These quotations are made to show that as yet there is no agreement as to what is best to be done in treating any individual case that may show itself in the future.

The treatment of the writer's case is given in the case report appended.

Author's Case.—Walter B. aet. 18 of Otterbein came to see me May 25th. 1908, because of a sore eye. He works on a farm and hence helps to take care of the stock thereon. The whole right side of his face was much swollen and tender, especially the glands of the neck. The eye was swollen shut, the lids being thick and heavy. Both the palpebral and the ocular conjunctivae were much swollen, the latter being in a state of chemosis. It looked like a case of gonorrheal ophthalmia although the lids did not have that board like feeling as we see in the latter disease, neither was there the characteristic purulent discharge present. There was but a slight discharge from between the lids. This condition was present now for one week. The cornea was clear and unaffected. The iris showed no inflammation and readily responded to light and shade. The patient's temperature was but slightly elevated and otherwise he seemed normal. The most peculiar thing about the case was the appearance of the everted upper eyelid. It seemed to be swollen into one huge granulation, under the overhanging edges were some smaller ones. These were quite soggy, but did not bleed readily to manipulation. All seemed to lack the pedunculated appearance described by other writers. The lower lid showed a similar condition.

The other eye was normal and remained so.

A bacteriologic examination repeated several times revealed no characteristic bacteria.

He was sent to the hospital for treatment, which consisted in a daily application of a two percent solution of nitrate of silver to the everted conjunctiva, and in bathing the eye every hour during waking hours with a compress wrung out of water as hot as the back of the hand would stand. Every three hours a ten percent solution of protargol was dropped in the eye. Every hour the eye was flushed with the following collyrium:

Zinc Phenolsuphonat	gr. j.
Acid Boric	gr. x.
Aquae Dest.	oz. j.

Between treatments and bathings the eye was kept bandaged.

Internally he was given several purges of calomel, and quinine and iron during his stay in the hospital.

After a few days, the iris seemed to be sluggish and discolored. A one percent solution of atropia sulphate was instilled every four hours until combatted.

At the end of the second week of his stay in the hospital there appeared in the lower portion of the cornea an infiltration involving the substance thereof, but not the superficial layer. It refused to stain with flourescein solution. The resulting opacity is negligible. His vision is normal. He was dismissed from the hospital June 28th. with the conjunctiva smooth and normal.

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DISCUSSION.

Dr. Robert S. Lamb, Washington, D. C.:—I had a case of this disease in a young patient from the West who was visiting in Washington. He was very fond of driving a horse and drove out every afternoon. I have always thought there was some infection from the horse. The treatment that I used was comparatively simple. Locally the copper sulphate and internally the administration of iron. The case was typical, with swollen lids and gland as large as walnut. I did not open the gland, but relied upon the internal administration of iron and treating the lid with copper sulphate.

Mr. Sydney Stephenson, London, England:—As bearing upon the history of Parinaud's conjunctivitis, there is one little bit of indirect evidence in favor of Parinaud's view, which may not be familiar to members of the Academy. In 1903 Doyle of Oxford, unfamiliar with Parinaud's ideo, published a note regarding a form of conjunctivitis which prevailed in autumn in the neighborhood of Oxford. He was unaware that Parinaud had made his contribution, but he characterized the disease almost in the exact words of Parinaud, and curiously enough, he traced this to the disease known as mange in dogs and animals. That is in support of Parinaud's claim that it is due to animal infection.

I was consulted some years ago by a famous English gynecologist suffering with conjunctivitis. The history was that in opening a uterine abscess, he had received a spurt of matter in the eye which afterwards resulted in this disease.

Regarding treatment of these cases, which are not rare in England, I have found that excision of the granules, followed by iodoform ointment is efficacious.

Dr. J. E. Brown, Columbus, O.:—I rise with the report of one case. I furnished a synopsis of this to Dr. Gifford of Omaha for his compilation on this subject, and it appears to be a typical case of the disease. The patient, who was under my care for some five or six years ago, was in my office within the past month. At this time, it was impossible to tell upon examination of the eyes, which one had been affected. When he came to me with a typical lesion of this form of conjuctivitis, he stated that he had been working on his farm, spreading fertilizer, and that the wind had blown the dust from this into his eyes. He came to me in the belief that some of this material was still under the upper lid. This fertilizer is in part a fish product, manufactured on the shores of Lake Erie, and whether or not the animal element in this had anything to do with the production of the disease is a point upon which I would not give a positive opinion.

Dr. Reeve, Toronto, Can.:—In the pre-bacteriological era, I had a case that corresponded in every respect to a typical case, confined to the upper eyelid of one eye, in a girl about twelve years of age. I made out nothing as to the etiology. It was not a case to correspond in the slightest degree to trachoma, but there was a discharge coming from the outer subconjunctival region and a definite enlargement of the preauricular gland. The case was treated by copper sulphate and argentum. This was many years ago. No relapse occurred. It was not supposed to be of tubercular origin.

Dr. Keiper (closing discussion):—The disease is certainly rare, but perhaps not as rare abroad as here. Any way, wherever a case is observed it should be put on record, in order that we may get some idea as to the important points connected with the disease, especially in the treatment of the disease.

STANDARDIZED RECORDS.

The Chair wishes to allow Dr. F. Park Lewis of Buffalo, five minutes in which to make some reports of general interest.

Dr. Lewis, Buffalo:—Last summer I prepared a paper for the National Educational Association on The Causes of Blindness, in which I made inquiries as to certain statistics, and I found to my amazement that there were absolutely no available statistics of the slightest practical value. There are a great many records of institutions which simply read: "Defective eyes, so many," compared with "Perfect eyes, so many"—of course perfectly valueless. It seemed as I looked into the matter that we were losing an immense amount of valuable material in the failure to have definitely standardized our records. There is a report of so many cases of glaucoma for the past year, and no record as to the results of the operative treatment, how many resulted in normal vision and how many became blind, and what result at the end of one or two years after the operation was performed.

If we might standardize our methods, so that we would have not only in our public institutions but our office desks, record cards on which might be formulated in brief form the color, age, nationality, sex, disease, operation performed, and this summarized, we would know certain facts that would be of enormous value.

I think you all know the work of the past two years with regard to the prevention of blindness and the Sage Foundation, and that there is an office in New York with a paid secretary, and in all the states, committees trying to get the subject into form, to develop into a definite, practical movement. I think you also know that a like movement has been organized in France under the auspices of the government, and that there is to be a meeting in Egypt in February, having as its purpose the same object. There are other phases of the same movement which are destined in a short time to take form. If our own movement becomes effective in the United States, there should be a co-ordination of effort in the different states.

This matter has been brought before the American Public Health Association and all the health officers are prepared to co-ordinate their work with that of the ophthalmologists; also all the social workers in every state, so that there will be ophthalmologists, sanitary officers and social workers who are prepared to enter into this movement.

As for the Committee on the Prevention of Blindness of the American Medical Association, it cordially asks the assistance of any man in the different states who cares to co-operate, and we would be glad to receive the names of any one who would work with us.

My idea is to urge the appointment of a committee here and now, at this meeting, to formulate a definite record card, on the causes of blindness which could be standardized and used. This would give us in a short time complete and available data.

This movement is not only one for the prevention of blindness, but it has become one for the conservation of vision. In the National Educational Association, a committee has been appointed with regard to the making of books, with reference to the paper used, in order to standardize some rules that could be carried out. This committee will have as its members some prominent school man, a publishêr, a psychologist, an electrical engineer and an ophthalmologist. The work will be done on scientific lines and with the co-operation of the ophthalmologists of the United States. It is the broadening of the work of the committee on the prevention of blindness in ophthalmia neonatorum into the larger one of blindness in general.

It became evident that trachoma is general throughout the United States, that our ports are not preventing its entrance, and therefore a committee on the prevention of blindness under the chairmanship of Dr. John Greene, Jr., of St. Louis, will take up the study of trachoma and will endeavor to secure knowledge as far as it can be obtained, concerning the extent of trachoma throughout the United States.

Also, under the chairmanship of Dr. Mark Stevenson, an investigation as to the causes of blindness due to industrial accident will be undertaken. In the German statistics, it is found that there is a sudden rise in the number of accidents on Monday, and a decline to Friday and Saturday, and a relation is shown to the Sunday drinking and to the fatigue of the week's work .

Also a committee will take up the question of congenital blindness. Multitudes of children should never have been born. These are matters of such tremendous importance and economic value to the whole country it seems that it is a subject which ought to be understood.

I move therefore that a committee be appointed to standardize records, and provide for the introduction into dispensaries and hospitals of a method by which they can be used.

Dr. Sherman, Cleveland, O.:—I find that the examination of the records at home and abroad are absolutely valueless, and in order that this vast material may come under the excellent suggestions of Dr. Park Lewis, I would suggest that this committee also take under advisement the importance of a universal card. I offer this as a suggestion.

Motion seconded, and motion of Dr. Lewis, as amended by Dr. Sherman was carried.

THE CONJUNCTIVAL TUBERCULIN TEST.*

HERMANN J. ACHARD, M. D.
CHICAGO, ILL.

Mr. Chairman and Gentlemen of the Academy, I am keenly conscious of the honour conferred upon me by the invitation of your Secretary to speak to you upon the conjunctival tuberculin tests and desire to express to you my appreciation and thanks.

It is not my purpose to enter largely into the history of the diagnostic tuberclin tests in general and of the conjunctival test in particular, or to present for your consideration a large series of reports of tests either on tuberculous or on well persons. I shall not even weary you with an extensive amount of literary references, although I have, since the introduction of the local tuberculin tests in May and June, 1907, studied many hundreds of *Arbeiten* on the subject. I rather propose to discuss the conjunctival test from a perspective view point, considering briefly its diagnotic value, its possible dangers and its relative clinical necessity. The question on which you as ophthalmologist must more particularly take position is, whether the conjunctival tuberculin test is of sufficient value and neccessity to justify its general or even frequent application in the face of the untoward results which have, infrequently it is true, been observed. Whether the possible advantages are sufficient to overbalance the possible harm and whether the procedure should be recommended to the general practitioner or should be limited to the use of the tuberculosis specialist, possibly to the ophthalmologist in behalf of the tuberculosis physician is a proper problem for your discussion. Further, you have to determine whether the method is of value in your own work, in establishing the tuberculous nature of certain eye lesions, the etiology of which may not be clear.

Permit me to say for the sake of correcting an error prevailing widely, that the test under discussion should not be called either by the name of Wolff-Eisner or by that of Calmette, because it is hardly a good plan to attach the name of any investigator on to either a disease or a method,but if we did wish to remember the reaction by any name or names we should have to use those of both of these men. Although it was Wolff-Eisner who first of all mentioned the fact that the conjunctival mucosa in tuberculous persons is hypersusceptable to the instillation of tuberculin in a 10 percent dilution (May 15 1907),

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*Read by invitation.

Professor Calmette, exactly one month later (June 17, 1907), published a method of administration for diagnostic purposes which he had already fully elaborated. Thus you see that both men have equally contributed in evolving this diagnostic method.

I should like to say, further, that the name selected by Calmette for his method, *i. e.*, "The Ophthalmo-, or Oculo-Reaction" is not a fortunate one, and that Wolff-Eisner's designation of "Conjunctival Tuberlin Test" should be chosen instead. The test primarily is not an ophthalmic or ocular one because it does not involve the eye, and should not do so. It is a test applied to the conjunctiva and in its normal evolution affects only the conjunctiva.

The specific methods for diagnosing tuberculosis may be broadly divided into two classes; first, the tuberculin tests and second, the serum tests; both are of immense importance for the early discovery of tuberculosis. We know from autopsy records that by far more people are tuberculous than phthisical, which means that a great many more people are cured of their tuberculosis than die of it, and the former are cured, often without knowing of the existence of their tuberculosis. The progressive evolution of the tuberculous process into phthisis depends upon a predisposition or upon a want of ristance to the pathogenic action of the tubercle bacillus, and the occurrence of phthisis is therefore due to tuberculosis *plus* predisposition. In the predisposed especially, the earliest possible discovery of the existence of a tuberculosis focus is important, clinically and prophylactically; and since environment plays a not inconsiderable role in the production of the predisposition, it has been suggested by Calmette, and by Wolff-Eisner, among others, that tuberculin tests should be made, in certain *milieus*, at regular intervals, in order to detect and treat, and also to isolate cases of tuberculosis as early as possible.

The tuberculin tests depend for their action upon hypersensibility, while the serum reactions depend upon the degree or amount of protective substances which have been formed in the blood in the struggle of the organism against the infectious disease. The degree of the tuberculin reaction depends in a measure upon the amount of tuberculin absorbed, and it is for this reason that the general reaction produced by the subcutaneous, the conjunctival and the cutaneous tuberculin tests become slighter in degree in the order named.

The serum tests, as has been stated, indicate the degree of defence put forward by the organism, and while they are of undoubted diagnostic importance, (von Ruck)[1] they are of even greater importance as a means of controlling the success or non-success of the specific treatment.

It is indisputable that the specific diagnosic methods in general constitute a very important advance in our ability to recognize the existence of tuberculous disease earlier than we have ever been in a position to do. The fact that anyone of these methods might be abused and make a *pons asinorum*, and that we might attribute less importance to a careful physical examination and painstaking appreciation of the history, the present condition and environment of our patients because we can receive important information from such a simple proceeding as a tuberculin test or a serum examination, cannot detract from the importance of these tests in cases in which an existing lesion is not sufficiently marked to permit of calling it tuberculosis and in which the sputum diagnosis, *e.g.*, is negative because the tuberculosis is as yet of the closed form. It is, however, a good plan to treat all patients suspected of tuberculosis as tuberculous, the more so since the treatment in vogue is entirely a general and common-sense one, and if it is suplemented by specific remedies these can in no way injure the patient if properly administered; on the contrary, he will in any case benefit from such treatment. The dosages in the use of specific remedies are fortunately no longer large enough to act in the unfavorable manner in which the old tuberculin of the first tuberculin era only too often acted, *i.e.*, by reactivating a latent focus. In a condition which is manifestly and frankly tuberculous, where tubercle bacilli are found in the sputum, where we have a clear history of loss of weight and appetite, of cough, expectoration, where we have the unmistakeable physical findings of destruction of lung tissue, the application of any tuberculin test would be idle, because the purpose of these tests should only be to aid in the elucidation of an obscure condition, and not simply to gratify idle curiosity as to how a certain patient may react to the test.

If, however, the necessity exists for making a specific diagnostic test, and if the serum diagnosis (agglutination, opsonic index, etc.), is not feasible, we should carefully select the one among the many possible tuberculin tests which will offer the most definite information with the least possible degree of harm to the patient. I shall omit the subcutaneous tuberculin test from the present consideration, because it will hardly be denied that this test should only be applied by specially trained physicans, and only on patients who can be under constant observation and who can be put to bed for the time being. There remain, then, the cutaneous test of von Pirquet and its modification on the one hand, and the conjunctival tuberculin test or its modifications, in which the tuberculin is applied to a mucous membrane. In both classes we need not really consider the modification at all, because they do not constitute any essential differences.

A tuberculin test may be applied for one of several possible purposes:

(1) To determine whether the tubercle bacillus has at one or another time come in contact with an organism, or, as von Pirquet expresses it, whether the organism "has become acquainted with the tubercle bacillus."

(2) To determine the existence of an active tuberculous process somewhere in the body, or to determine whether a certain process or lesion is tuberculous.

(3) To determine whether a tuberculous process has been arrested, and whether it may considered as healed.

The first point is somewhat of academic interest, and does not necessarily determine the existence of an active or progressive tuberculous process, since this may be quiescent or latent. If an organism has ever been infected with tubercle bacilli, it will usually react to the cutaneous tuberculin test, no matter whether the process is active or latent, or even healed. This test is therefore of greater diagnostic value if negative. It gives comparatively little, if any, information concerning the presence of active disease. It has, however, been of considerable assistance in verifying the results of the autopsy records of Naegeli, Schmorl, Lubarsch and others, and of the subcutaneous test made, *e.g.*, by Franz, for the purpose of determining the general distribution and frequency of tuberculosis; and, it has been stated by von Pirquet himself, that on account of the extreme sensitiveness of his test, at least 90 percent of healthy adults react to it, because this proportion has at one time or another been infected by the tubercle bacillus. This, according to Hamburger,[2] is for the population of Vienna, already the case at the age of fourteen.

The cutaneous test, while thus not of immense diagnostic value, on the other hand assists in showing the essential curability of tuberculosis; in fact it proves what I have said before, that a great many more people are tuberculous than die of tuberculosis. Over ninety percent of all adults react to the cutaneous tuberculin test; only about eleven percent die of the disease, the other seventy-nine percent recover.

The third point, which we will discuss before the second, has been insisted upon for the subcutaneous test by Drs. Carl and Silvio von Ruck[3] in 1899, by Heron[4] in 1901, and by others, for instance Mitulescu, more recently. Dr. Silvio von Ruck[1] concludes from his experience with the conjunctival tuberculin test that it may be asserted that it also may supply the final proof of a cure, just as the subcutaneous injections have been employed for the same purpose.

The principal purpose of the diagnostic tuberculin application is, however, to ascertain whether a given lesion or pathological process is tuberculous in nature. On employing diagnostic sub-cutaneous tuberculin injections this is ascertained with comparative ease because of the occurrence of a focal reaction, which is of even greater importance than are the general symptoms of fever, malaise, etc. In the so-called local tuberculin tests too little tuberculin is, as a rule, introduced into the circulation to bring about such a focal reaction; in fact, for the cutaneous modes of administration, I have not found a single instance recorded, and only a few general reactions have been reported. After the conjunctival tuberculin test, I have, in the Winyah Sanitarium in Asheville, North Carolina, seen the focal reaction occur in at least three early cases of apex localization, and I am told by Dr. von Ruck that in the course of the last two years about twenty more have been observed. The occurrence of such focal reaction would naturally tend to make the test of greater diagnostic value by indicating the exact seat of a tuberculous focus. In general, it is asserted that with a proper attention to condition , and with a proper interpretation, a positive conjunctival tuberculin reaction indicates the existence of active disease.

In the application of any diagnostic or therapeutic measure whatever, the foremost principle to be observed is that of *nil nocere*, and we may properly raise the question as to whether the tuberculin tests fulfill this postulate. For the cutaneous test we may reply affirmatively without hesitation; at least, I have not found a single case recorded in which it has produced more than, at most, a passing and very slight local discomfort, and the instances of general reaction were only minimal in degree and number. In regard to the conjunctival test, both Calmette and WolffEisner speak of many thousands of tests of which they have record, and in which no permanent harm has resulted from its administration.

The phenomenon of anaphylaxis, upon which the tuberculin tests depend, is a very difficult one, and by means fully understood. Permit me to say, in passing, that it was not Richet, as frequently asserted (on his own authority), who studied the question first. About the middle of the eighties von Behring investigated what he called hypersensitiveness. Briefly, anaphylaxis, or, perhaps, better *allergie* (von Pirquet), consists in the fact that a second introduction of a foreign proteid into an animal organism produces a distinct reaction which is not observed after the first introduction. Using a specific proteid, such as horse serum, or a toxin, *e. g.* tuberculin, the first introduction into what the French call a "pew" organism, remains without any symptoms; but if sometimes before the injection of the serum an amount although small, has been introduced, or if in the case of a tuberculin injection the organism had at some earlier time been subjected to a tuberculous infection with subsequent tuberculosis, in the course of which tuberculous toxins (tuberculin) have been set free, a fever reaction occurs to the tuberculin administration. This is local or general, or both, according to the dose absorbed, and according to the power of reaction of the organism, and gives sometimes rise to focal inflammatory symptoms. Von Pirquet was led to employ this fact in the cutaneous administration of tuberculin, and Wolff-Eisner, and soon after him Calmette, argued that the far more delicate membrane of the conjunctival sac would be more apt to respond to the slightest stimulation. After that, as might be expected, the other accessible mucous membranes, those of the nares, the vagina, and even of the urethra, were subjected to the local application of tuberculin in a craze for producing modification of the method, just as the cutaneous tuberculin test has been modified in every conceivable manner.

Most tuberculosis physicans who have employed the conjunctival tuberculin test agree in the assertion of its originators, that the undesirable, and even serious, symptoms and accidents which have been observed in the course of the reaction, are due to a faulty *technique* and to an improper selection of cases, and that with an exact method and a careful observance of contraindications, the test is without danger. I do not desire to deny this; in fact, I am convinced, from my own observation and from a careful study of the literature, that most of the reported accidents could have been avoided. I also admit that the possible, but remote, danger of a remedy or method does not *ipso facto* justify its condemnation. We would not dream of giving up ether or chloroform narcosis in spite of the not inconsiderable number of deaths due to both. We continue to prescribe morphine, nitroglycerine, strychnine, atropine, and other powerful drugs although they have many deaths to their credit. Laparotomy is a recognized and just mode of interference in many pathological conditions, although a large number of patients have succumbed to the operation. But we are careful to obtain the services of a trained anesthetist to administer the ether or chloroform for us. We prescribe or dispense the exact amount of morphine, nitroglycerine, strychnine, and atropine, which we consider necessary for a particular condition, and no more. We prefer to have our laparotomies done by men who have fitted themselves for the work, and who fully understand, and are able to cope with the possible dangers, and to eliminate every such possibility as much as feasible.

In the same way, I hold that the conjunctival tuberculin test, employed by unskilled hands in improperly selected cases, is a dangerous procedure; not so much on account of any inherent toxicity of the remedy, the dose employed being far too small to exert any notable toxic effect, but on account of the extreme sensitiveness and vulnerability of the organs involved. If it is improper for the general practitioner or for anyone but a skilled ophthalmologist to operate upon the eyes, it is equally improper for them to subject these organs to the possibility of injury which undoubtedly is present in a deliberately produced conjunctival inflammation; and, this especially true when there are present any affections of the ocular apparatus whether they are tuberculous in nature or not; it is even true where there is a history of earlier though healed disease in the eye, as we shall see presently. It has been shown (first, I think, by Feer[5] in Heidelberg, and by Citron[6] in Berlin) that scrofulous children show especially marked reactions to the conjunctival tuberculin test. According to Wolff-Eisner's reasoning, this might be explained as indicative of a fair degree of tuberculous immunity enjoyed by such children; but however that may be, the fact remains that the test may expose the eyes to a very grave danger, and a considerable number of cases are on record in which even permanent injury has resulted.

Aside from the possible dangers of the procedure, opinions are practically unanimous concerning the diagnostic value of the conjunctival tuberculin reaction. It is almost generally conceded that a marked positive reaction indicates an active disease to which the organism opposes a satisfactory degree of resistance. Lesser reactions have been explained as designating laten-inactive or laten-active foci, and negative reactions in frankly tuberculous cases show the absence of any power of resistance and are prognostically unfavorable, while negative reactions in clinically non-tuberculosis persons may be accepted as indicating the absence of tuberculosis, if supplemented by a negative cutaneous tuberlin test, which then means that the particular organism has never been subject to tuberculous infection at all.

It is strange, in view of the many favourable opinions, that Maragliano[7] has arrived at an almost opposite conclusion. He denies the value of the conjunctival test *in toto*, and ascribes the favourable reports to auto-suggestion on the part of the investigators, or to deliberate irritation of the conjunctival mucous membrane. F. P. Weber[8] also believes that there has undoubtedly been a tendency to magnify the reaction as a diagnostic test of tuberculin. Bandelier-Roepke[9] insists that the conjunctival tuberculin *must* remain unreliable in human tuberculosis, and especially that it may remain negative in spite of active tuberculosis, because the admissible strength of solution does not always produce a reaction. (*loc. cit.* page 37.)

Von Szaboky[10], in Graz, found that the cutaneous tests gave better results in the early stages of pulmonary tuberculosis than did the conjunctival, but less good results in the second and third stages; but considering that in the clinically non-tuberculous the conjunctival test is rarely, the cutaneous often, positive, and that in suspected cases the conjunctival test gives valuable information, the author nevertheless thinks it the more valuable of the two, although he denies its specific character. Many authors, for instance C. Annoni[11], admitting that the conjunctival tuberculin test is of at least equal value to the cutaneous, nevertheless prefer the latter, at least in children, because it has no contra-indications, is easily managed and watched, and is not productive of disturbance.

It has been shown by von Ruck[1] that the occurrence of the conjunctival tuberculin reaction in tuberculous patients is influenced by specific treatment. Of 44 untreated cases, 63.64 percent gave a positive reaction. Of 34 cases under specific treatment for a short time, 44.1 percent reacted. Of 18 cases under specific treatment for six months or longer, 27.7 percent reacted. Of 23 healed or arrested cases, none reacted. It is therefore stated, for instance by Eyre, Wedd and Hertz,[22] that the conjunctival reaction will be of value in indicating when therapeutic injections of tuberculin may be safely discontinued.

As to the possible danger of the reaction, Calmette[13] claimed, on the occasion of a comparatively early report before the Academy of Medicine in Paris, January 14th, 1908, that more than 10,000 cases already tested, the harmlessness of the method had been proved. In the discussion of this report, Delorme[13] cited 39 cases in which excessive reactions had occurred, and since that time many more severe reactions productive of discomfort and pain, in fact ocular disease lasting for weeks and even months, and some in cases even permanent injury has been reported. For this reason Wiens and Guenther[14] warn against the test as by no means such a simple matter as had been assumed. It is liable to aggravate a simple conjunctivitis and cause serious trouble as they illustrate by several instances from their experience. Reichmann[15] indeed concludes that the test, in spite of its apparent simplicity, is not adapted for the general practitioner, since the patient should be kept under close observation—this in spite of its undoubted clinical value.

The fact that serious accidents have sometimes followed the administration of the conjunctival tuberculin test, can, it is true, not argue against its usefulness, but it renders the test inadvisable for the general practitioner. Even a mild conjunctivitis which may pass off in a week or two may cost the physican his patient. People do not enjoy being made the subject of what they conceive to be experiments. Unless we can assure them that a certain procedure is therapeutic and undertaken with a curative aim, they will have none of it. If any test possesses a possibility of harm, the patient must be fully informed of the nature of this possibility, and must decide for himself whether he will or will not have the test applied.

In the causation of the untoward results observed there are several factors to be considered, which are enumerated by Smithies and Walker[16] as follows: (*a*) The possibility of poor *technique* in administering the tuberculin. (*b*) The possibility of difference in the tuberculin preparations used. (*c*) The difficulties encountered in demonstrating certain cases to be clinically tuberculous, *i.e.*, the difficulty in the explanation of the reaction. (*d*) The lack of definite or uniform standards for judging the occurrence or the severity of the conjunctival reaction. (*e*) The possible presence of unknown conditions which may modify or prevent the reaction in tuberculous patients, or which might bring about a reaction in non-tuberculous patients. Smithies and Walker give their opinion that none of the tuberculin reactions can take the place of thorough examination of the patient from every view point.

Roekpe[17] obtained a greater number of positive reactions by repeated instillations in the same eye, and in this manner reactions have often been obtained in healthy persons. So Klieneberger[18] found that the instillation of tuberculin in the healthy conjunctival sac of a healthy person produced an anaphylactic condition through which a second instillation in the course of about eight days was followed by a positive reaction. Wolff-Eisner[19] therefore advises that the second instillation, if it is necessary, should be made in the eye not previously tested.

A. Napier[20] reports two cases, tending to show that the instillation of Calmette's solution, even when it gives rise to no apparent reaction, brings about a local change of some kind which responds sharply to the subsequent introduction of even a moderate dose of tuberculin into the circulation. It then causes the conjunctiva to react locally exactly as a latent tuberculous focus would. S. Cohen[21] also reported that a subsequent subcutaneous injection of tuberculin is liable to produce a local reaction in the eye, if this had not been observed before, or cause it to return after it had already gone down. Smithies and Walker (loc. cit.) say that one of them was able to produce a slight conjunctival reaction in himself by the subcutaneous injection of one milligram of tuberculin after a previous instillation of tuberculin in the conjunctival sac had failed to give a positive reaction. Stadelman[22] found that the cutaneous as well as the conjunctival reaction is liable to flare up again if tuberculin be injected for ordinary diagnostic tests or for the purpose of treatment even weeks after the primary reactions had dissappeared. Many physicans, for instance Schrumpf[23] of Strassburg, have encountered considerable difficulty in administering tuberculin for the purpose of treatment in patients who had been subjected to the conjunctival tuberculin test, because the conjunctival reaction would return again, and sometimes cause distressing symptoms

The contra-indications against the instillation of tuberculin in the eye are given by S. C. Higgins[24] as follows: "The existence of inflammation of the eye, especially the exterior, such as trachoma, or conjunctivitis, or the presence of corneal scars. Further, it is ill-advised to employ tuberculin in one eye if the other has been diseased. Also disease of the deeper tissues, such as choroiditis, furnishes a contra-indication. The test should not be made in old people, whose tissue resitance to any inflammation is impaired. Errors of refraction and eye-strain are not a contra-indication, but when the evidences of a marginal blepharitis are present, the test may prove confusing."

The striking point in regard to the conjunctival tuberculin reaction is, that there exist a good many contra-indications which are entirely absent in the cutaneous method. Above all is the fact of importance that especially in scrofulous children, the conjunctival tuberculin test is exceedingly apt to cause very severe reactions and painful and prolonged injury, not only to the conjunctiva, but even to the eyeball. Yet it is especially in this class of cases that a specific diagnostic method would very frequently be desirable, and since just here the conjunctival test must fail us because it is contra-indicated, we labor under a very considerable handicap. Fortunately the cutaneous and subcutaneous tuberculin tests, or some of their modifications, are fully of a nature to afford us the information which we may desire, provided they are properly interpreted.

The conjunctival tuberculin test suffers also under the disadvantage that its administration is practically limited to two applications. We have seen that repeated instillation of tuberculin in the same eye cannot afford any definite information because hypersensitivness is created by a first application which would in itself produce a positive reaction to a second application. Now if, as asserted by Roepke, only fifty percent of the tuberculous patients react to a first instillation of a two percent solution of tuberculin in one eye, the possibility of erorr by this method is very considerable.

A further disadvantage of the conjunctival method is that the *technique* is not by any means as simple as Wolff-Eisner[25] would have us believe. He claims in the second edition of his book that the *technique* is even simpler than for the cutaneous tuberculin test, but we find in practice that it is by no means as easy to obtain the permission of our patients to instill, no matter what solution, into their eyes, as it is to get them to submit to a simple little scratching of their arms. The more so, since we can positively promise that the cutaneous administration of tuberculin will in no case produce a painful lesion and will only cause a slight redness with, at worst, a very inconsiderable itching, while we cannot at all be as positive in our promises when we make a conjunctival tuberculin test. The positive reaction is not devoid of pain or discomfort and is in a great many cases accompanied by a good deal of very positive distress and loss of function. Moreover, the instillation of tuberculin is often useless because the tuberculin is washed out by lacrymation and this may lead to a faulty diagnosis. It is for these reasons that I would refrain from encouraging the general practitioner to administer the conjunctival tuberculin test.

From the foregoing considerations we conclude that the conjunctival tuberculin test as proposed by Wolff-Eisner and Calmette is of undoubted value for determining the existence of an active tuberculous process. We admit that it may to a limited degree be of prognostic value, as asserted by Wolff-Eisner. We find further that the test affords us a valuable information as to the possibility of discontinuing specific treatment and as to the accomplishments of a cure. It is agreed that the method is a valuable one and in selected and indicated cases to be recommended, but all this with the proviso that the test should be carried out by the physicans who have carefully studied the problems involved, who are fully aware of the possible dangers and are able to, if not prevent, then to cope with them, and with the further proviso that all contra-indications and precautions should be duly considered. In the great majority of cases, however, I hold that a diagnostic method which is productive of a very real, even if slight, amount of discomfort and which has an intrinsic possibility of danger, should be employed only after all other methods of ascertaining the existence or absence of tuberculosis have failed. There are so many other methods of examination, more especially the careful consideration of the history of the patient, of his physical condition, of his environment, the conditions under which he lives and has lived, etc., that the conjunctival test should become necessary only in a very small number of cases, and then should be carried out only under the conditions enumerated.

There is another aspect of the question in which you as ophthalmologists are more immediately concerned, and that is the employment of the tuberculin test to determine the tuberculous nature of an existing eye lesion. Sydney Stephenson[26] was one of the first ophthalmologists to apply the test for the differential diagnosis of ocular lesions. Stuelp[27] observed that nine out of fourteen eye patients with tuberculosis or symptoms of tuberculosis, after instillation of tuberculin gave severe inflammatory symptoms lasting up to seven weeks, in eyes which were formerly diseased or if the other eye was affected. Bruns[28] maintains that the conjunctival tuberculin reaction cannot be interpreted to be an indication of tuberculous involvement of that eye. G. S. Derby[29] has tested about 150 cases of eye disease, in order to determine their tuberculous nature. His experience has led him to fear the conjunctival test in all diseased eyes, even though the process is healed, and in the healthy eye when there is active disease in the cornea in the other. Bandelier-Roepke say that the conjunctival reaction should not be produced when there exists a suspicion of eye tuberculosis. (*loc. cit.* 91.)

Verhoeff[30] says: The conjunctival test for tuberculosis would seem at present to be of very limited value so far as the diagnosis of ocular tuberculosis is concerned. The test, in his opinion, should never be used for this purpose since it is not entirely free from danger to the eye. Moreover, it is unsatisfactory, because the affected eye can neither serve as a control, nor be used for a second instillation.

L. C. Peter[31] is of the opinion that as a diagnostic agent, from an ophthalmic point of view, the Calmette reaction has little to commend itself in determining the character of lesions and diseases of the eye. The possibility of causing serious damage by a single application to an eye which may be the seat of even a low-grade conjunctivitis, or to a perfectly healthy eye by repeated instillations, has been fully demonstrated. These results may be obtained in an eye which is not the seat of tuberculous processes, and, therefore, in addition to the dangers, there is an element of uncertainty added, which largely nullifies the value of the test. The natural inference, therefore, according to Peter, is that the Calmette test should not be used in determining eye conditions. He wishes to emphasize the conclusion, because we have other and better methods of application without the risk of serious injury which may attend the conjunctival test.

In the first discussion of the subject, which occurred in the Chicago Medical Society (February 28th, 1908), your secretary, Dr. Suker[32] warned against the indiscriminate use of the conjunctival tuberculin test, and pointed out its possible dangers. Only the other day Dr. Suker called my attention to Mr. Sydney Stephenson's[33] translation of Darier's Ophthalmic Therapeutics, just off the press, in which the method is discussed, and I cannot do better than to close my paper by quoting the opinion of your guest of honour. He says, on page 8, "The method is valuble in general diagnosis, but in ophthalmic practice it should not be used, for if a slight tuberculous lesion of the cornea or iris is present, it may set up serious complications gravely endangering the sight of the affected eye. Moreover, in the absence of all tuberculosis, the opthalmic reaction may provoke a conjunctivitis difficult to cure, especially when a follicular state of the mucous membrane already exists, and still more so when the individual is affected with trachoma, even of slight degree."

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DISCUSSION.

Dr. Keiper, Lafayette, Ind.:—It has been well said: "There are no short cuts to diagnoses." I have had some experience with the tuberculin reaction, having been very enthusiastic when the subject first appeared, and read a paper once on the subject, and I must confess that since then my enthusiasm has waned a good deal.

The accident insurance companies will pay indefinitely equal to the value of loss of life if one loses two eyes; that is the value of two eyes is the same as a human life. My experience has led me to be exceedingly cautious about the use of this thing, and depending on it for diagnosis of an active tuberculosis process in an individual. We have a number of things to consider. We have other methods, the examination of the sputum, the putting of our ear and stethescope to the chest, the Moro and Von Pirquet reactions and other ways, without pinning our faith to any one method of diagnosis. I would be exceedingly cautious about any one method of diagnosis. I would be exceedingly cautious about using this method, especially in organs regarded commercially as valuable as a human life.

Dr. Achard (closing):—I only wish to say that we seem to be all of one accord, that the conjunctival tuberculin test is too risky to be attempted by the general practitioner. They are not so cautious in Germany and France, where they use it with enthusiasm. I agree with the other speaker, that there are other methods whereby we can diagnose easily, and in those cases too early for the general practitioner to diagnose, there are plenty of men who have made an extended and special study, so that they can make the diagnosis.

A PRACTICAL NOTE ON THE USE OF BI-FOCAL LENSES.

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It is very probable that there is very little in this communication which is not known to those of you who have worn bifocal lenses, but as far as I know ophthalmic literature contains no formulation of this knowledge for the guidance of those who are not in this class. This note is therefore offeren as a stop-gap.

Bifocal lenses are feasible in practically every case, as their convenience must be universally conceded, when presbyopia is added to a refractive error for which lenses must be continually worn. When they are rejected it is for one or more of the following causes:

(1) A matter of personal vanity—bifocals being proof of the age which it is the desire to conceal;
(2) Defects in the lenses of faulty placement of the same; and,
(3) Failure to give necessary instructions.

The responsibility for the first lies wholly in the patient; for the second, in the optician; and for the third, in the physician.

The first alone may be incorrigible. The second and third can be eliminated by a systematic attention to details which includes:

(A) The use of lense measure and centering device;
(B) Careful adjustment of the frames; and,
(C) Specific directions about the head movements necessary to bring the lenses in turn between the eyes and the object for both infinity and convergence.

It would be superfluous to comment on "A." On "B" it is noted that unusual accuracy is demanded in the frame measurements. A nose-piece 1-16 too high or 1-16 too low, or one that gives a P. D. 1-16 too wide or too narrow, presents almost insuperable difficulties. Moreover it is possible to have those measurements accurate and the lenses still improperly placed because one eye may be nearer to the nose than the other. The crest must be shifted accordingly. The left eye is rarely the nearer, the right frequently. My records show an average of 8 to the 100. Whether this is a standard for estimating the relative sizes of the frontal sinuses it might be interesting to determine.

Specific directions (C) about the head movements are to make it plain that the position of the chin is all important, retracted for infinity, advanced for convergence; the former drops the segment out of line, the latter brings it up into line. This is just the reverse of the usual motions and it requires perseverance to make these new motions automatic as they must be. This perseverance involves the continuous wearing during the waking hours with the injunction that fatigue and other possible distress must find relief in temporary closure of the eyes, not in the taking of the glasses off. As a rule a week of this perseverance will settle the most rebellious eyes. The trick is learned.

Heterophorias and heterotropias may serve as interferences, but as I have no record to this effect I naturally conclude that they must be very rare exceptions. If the contrary were true I should myself furnish an illustration, for I get binocular single vision only with special effort and for limited periods.

The solitary objection to bifocals is that in going down stairs one must always bend the head well over or not look at the steps at all. The size and character of the segments are immaterial.

DISCUSSION.

Dr. Derrick T. Vail, Cincinnati:—Practical suggestions are always valuable and cannot be repeated too often. This paper is a gem in that way and I heartily endorse it. There is a lens which is now being used extensively, the so-called "Kryptok" lens, which, as you know, has a segment below invisibly fused the lens above. The name "Kryptok" is a patent name, given by a firm of commercial men and protected for personal gain. I have often thought it was furthering the interests of a private company to use a patent name in writing our prescriptions. I think the dignified and proper way to do in ordering such lenses, if you desire to have the fused, is to write the prescriptions "fused bifocal lenses," or "fused bifocal toric lenses." It is certainly very much better and more dignified to order a "fused bifocal toric lens" than to order a "fused 'Kryptok' lens."

Dr. E. J. Bernstein, Kalamazoo, Mich: — In talking about this practical point, there is one little point, doubtless well known to most of you, which has helped me get over the trouble of bifocal lenses. First, I try and persuade as many as possible to get fused ones, as in them the line of demarcation is unnoticeable, then I warn the patient not to make the common mistake of trying to look at their feet through their glasses when they first adopt them. If they will remember that ordinarily we look 30 to 40 feet in advance and make mental notes of the obstacles one meets and not at our feet when walking without glasses, and act the same with glasses as they do without them, most of the trouble disappears.

INJURIES OF THE CILIARY REGION.

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Nettleship describes the ciliary region as "a zone nearly one quarter of an inch wide, surrounding the cornea." Injuries of the ciliary region should include contusions, perforations and lacerations of the sclera, pectinate ligament, iris, Schlemm's canal, the ciliary muscle and nerves, capsular ligament of the lens, and the ciliary body, and foreign bodies in the limbus conjunctivalis. The lacerated wounds, with protrusion of iris, ciliary body, or vitreous substance, are dangerous in proportion to the difficulties of securing early complete closure, with or without excision of the prolapsed or protruding uveal substance. Contusions are, likewise, more or less dangerous in proportion to the time required for complete absorption of the effused material in the contused part. Recovery from a contusion of the ciliary region must be inferred by the disappearance of the injected area, by contraction of the blood vessels to their normal size, and restoration to normal motility of the pupil, along with absence of photophobia. Contusion of the ciliary region may be attended by no distinctly localized objective signs; yet, the eye may, subsequently, be sensitive to light, with profuse lacrimation and increased tension of the globe. Should these symptoms continue for twenty-four hours, you may recognize a suddenly developed acute traumatic glaucoma. Contusion may be so slight, the symptoms may all disappear within an hour or so; and, some weeks later, gradual dimness of vision coming on, the development of a traumatic cataract may be recognized. This, however, is an extremely rare condition; as, blows upon the ciliary region of sufficient severity to produce concussion of the lens, nearly always give rise to complicating pathological conditions of some of the structures enumerated as belonging specifically to the dangerous zone. Sympathetic irritation in the fellow eye may come on within ten days, or it may not appear until the lapse of years. Mr. Geo. Lawson records an instance of a man who lost his sight from sympathetic ophthalmia, due to a punctured wound of the ciliary region of the fellow eye, occurring forty-two years previously. Fuchs says the minimum period may be a few weeks, whilst sympathetic inflammation has been seen to follow more than forty years after the injury to the fellow eye. Last year, at a meeting of the American

Medical Association, Dr. Arnold Knapp, of New York, reported a series of operations for the relief of glaucoma by cyclodialysis, as suggested by Heine, in 1905. Dr. Knapp's report concludes the operation was partly successful in cases of chronic glaucoma. I assume sufficient time has not elapsed to establish that operation in professional favor. Dr. Knapp says, "It can be conservatively stated that cyclodialysis is of value in certain limited conditions. It is indicated in advanced cases of glaucoma where ididectomy has not succeeded in reducing the tension."

As the operation involves the separation of the ciliary muscle from the sclera, and rupture of the pectinate ligament of the iris, more or less injury must result to some of the minute vessels entering or emerging from Schlemm's canal; and, sometimes, the walls of this canal, itself, will be ruptured. Hancock's operation, designed to cut the circular fibres of the ciliary muscle, sometimes relieved the tension of glaucoma; and so, for a long time, it was in great favor with some operators.

Anterior sclerotomy, as suggested by Juler, is a well recognized operation. This operation, however, does not involve any of the structures included in the ciliary region, excepting the sclera and the pectinate ligament of the iris, alone; and, has not been followed by cyclitis in any reported case within the scope of my research.

In December, 1872, a young man, of 20 was boring with an auger, carelessly laid the auger on a bench, with the bit projecting from the edge. Stooping, he suddenly threw his head to the right, driving the bit of the augur through the sclera and the ciliary body. The iris protruded, was drawn out, and snipped off with scissors, within an hour after the accident. Nearly a year later, the eye became sensitive to light, with profuse lacrimation. After some weeks of treatment by the family physician, he came to me. Oblique illumination disclosed an ovoidal tumor projecting from the corneoscleral juncture into the coloboma of the iris. The tumor was so well defined; and, having a small pedicle, I made an incision of the corneoscleral tissue, anterior to the pedicle of the tumor, which I turned out with a Daviel spoon, and, embracing the pedicle with iris scissors, snipped it off. It was three-sixteenths of an inch in diameter, or spheroidal form, and contained a quantity of sebaceous matter. The eye recovered promptly from the operation, with vision equal 6/xxiv. June 1st, 1876, the same patient returned, with the left eye crushed by the horn of a bull, who had gored him. Panophthalmitis had already set in, and I enucleated the eye. On the 10th of June, the patient seeming to be well on the way to recovery, with no morbid sensibility of the right eye, was allowed to return home, and has ever since enjoyed useful vision, being able to read the large type of a prayer-book. This was a case of large penetrating wound, with prolapsed iris, followed by the developement of a neoplasm at the site of injury. The neoplasm was removed, and the cyclitis, which existed at the time, subsided. It can hardly be claimed that smypathetic irritation of the fellow eye would have ever developed.

July 22nd, 1887, J. F., a tinner, was using a cold chisel upon an anvil, when a corner of the chisel splintered, and flew into the left eye, pasing through the upper lid, through the ciliary region, into the vitreous chamber. The splinter of steel was nearly three-eights of an inch long. The attending physician poulticed the eye, without recognizing the foreign body. Excruciating pain developed about the third day after the injury, and the case came under my care July 25th. Recognizing the fixed relation of the upper lid to the eye ball, I placed a retractor beneath the lid, and drew it forcibly from the globe, when the projecting piece of steel presented itself. I seized it with my thumb and finger, and pulled it out of the eye. The anterior chamber was filled with blood, most of which was in the form of a coagulum. I then seized the iris, and cut out about one-eighth of it. The patient got a dose of calomel, followed by salicylate of sodium, and recovered without further symptoms. Three months later, the lens became opaque. Seven years afterward, the patient returned with incipient cataract of the right eye. I extracted the lens from the left, and had the happiness of restoring vision equal 6/xviii. He died in 1908, without ever having suffered any recurrence of the cyclitis in the injured eye, or any irritation in the right eye.

I might recite a number of other instances of a similar character to show that it is not merely, as most writers have stated, even a severe injury of the ciliary region that produces fatal results to vision, but rather the particular structures involved, and the definite character of certain well recognized pathological processes which result disastrously to the patient.

In 1906, Dr. Wm. M. Sweet, of Philadelphia, reported to the American Medical Association a series of 420 cases of injuries to the eye ball, of which 51 were injuries of the ciliary region. These cases were reported for the purpose of showing the value of radiographic examination for the discovery of foreign bodies in the eye. There can be no question of the value of this method of determining the presence of foreign bodies; yet, even this will sometimes fail in case of very small foreign bodies, and especially those which have lodged in the uveal substance. Sometimes a small foreign body is concealed in the limbus by induration and vascularity, until cyclitis develops, and the eye is hopelessly involved.

The prognosis of all injuries of the ciliary region will necessarily depend largely upon the existence of cyclitis, and its duration. Any case of cyclitis which has resulted in plastic deposit should be viewed as an almost necessarily fatal condition. I might recite many instances of apparently trifling injuries of the ciliary region, which have been later followed by atrophia-globus, and subsequent sympathetic cyclitis in the fellow eye.

September 8th, 1910, I was consulted by a gentleman about thirty years of age, who, ten years ago, suffered an incised wound of the left eye. The globe was shrunken and depressed in the ciliary region on the nasal side. The eye was slightly sensitive to touch, but did not look irritated. The fellow eye was smartly injected in the ciliary zone, pupil small, patient suffering with photophobia, supra orbital and temporal neuralgia. The pupil yielded promptly to homatropin. The disc was hyperæmic, shading imperceptibly into the contiguous tapetum. I enucleated the blind eye; and on the 12th inst., four days days after operation, the right eye was free from irritation. The hyperaemia of the papilla had disappeared, and I am hopeful of the final result.

These citations are intended to show the irregularity and uncertainty of such cases, my main object being to contradict the radical position assumed by most of the writers on this subject. I may say, in conclusion, however, that I fully concur with those gentlemen who have advised the enucleation of all blind eyes, which have resulted from traumatism, involving the ciliary region.

THE EXTRACTUM CORPORIS CILIARIS IN THE TREATMENT OF SYMPHATHETIC OPHTHALMIA, WITH A REPORT OF TWO CASES.

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This study is presented not because it contains any great originality but because it offered an opportunity for the study of a disease which we are proud to say occurs quite rarely.

Organotherapy had its beginning in the very earliest times, in fact ever since man has recorded his deeds in a written language we find evidence of the use of animal organs for curative purposes. People ate lion's flesh to make them strong, dog's teeth were consumed to prevent the decay of the same structure in man. The liver of the mad dog was used for the cure of the bitten individual, etc. etc. It remained however for Brown-Séquard to give a new impetus to this very interesting study by the exploitation of testicular juice. Since then organotherapy has become quite common and the study of it decidedly complex. The supposition of course is that the organ obtained from a healthy animal is capable of supplying something which the diseased organ is no longer able to produce.

The normal aqueous contains very little, in fact only a trace, of proteids, while in certain pathological conditions the amount of albumen increases decidely. The ciliary body under normal conditions secretes an aqueous practically free from albumen and fibrinogen while in certain diseased conditions it no longer has this power and consequently the aqueous contains albumen and fibrinogen, and as a result of this the pupil becomes obliterated by a deposit of fibrin, the vitreous undergoes changes and the eye ball becomes soft. If an iridectomy is attempted the resulting coloboma soon becomes obliterated by a rapidly forming deposit of fibrin, in other words we have a condition which we usually term "sympathetic ophthalmia." I shall not attempt any new hypothethis to explain this condition, suffice it to say that notwithstanding our advanced therapy sympathetic ophthalmia does occur and I presume will continue to do so.

Ever since Dor (1898) lauded the therapeutic value of the liquid extract of the ciliary body it has been my desire to try it. During the past year the opportunity presented itself. J. C. aet 13 years was struck by a piece of broken glass over the closed left eye, on June

2nd, 1909. The bit of glass cut through the upper lid and penetrated the eye ball cutting through the ciliary body, producing a wound about 5 m m long, through the sclera just beyond the clear cornea and parallel with it, in the upper inner quadrant of the eye ball. The iris prolapsed. The eye was seen within twenty-four hours, rendered as aseptic as possible, the iris excised and the eye dressed. By the usual after treatment the eye made a good recovery with a coloboma upward and inward. The right eye displayed no irritation and the injured eye made an uneventful recovery. The patient was discharged Sept 7th after three months and the parents instructed to be on the lookout for any future trouble and under no circumstances to neglect the boy as a condition might arise which might result in blindness. Notwithstanding these admonitions, the boy returned on Novmber 6th with a well marked condition of sympathetic ophthalmia with the vision reduced from normal to 20/100 in each eye. He was put upon large and increasing doses of the salicylates for several weeks, but without any result, in fact the vision became diminished.

It was then that the extract of the ciliary body was begun. This was prepared by my friend Dr. Proescher, Pathologist to the Allegheny General Hospital, in the following way:

Fresh ox-eyes were procured from a large abattoir and kept as clean as possible. In the laboratory each eye was dipped into boiling water to sterilize the outer parts and then transferred to a sterile normal salt solution. The ciliary bodies were then excised under strict asepsis and transferred to a small receptacle containing normal salt solution in the proportion of 1 to 3 and thoroughly macerated with powdered glass and then placed into a refrigerator for twenty-four hours, after which they were filtered in a special form of filter devised by Dr. Proescher. Each lot of the extract was tested and found to be sterile. This extract was then injected subconjunctivally, 1. c. c. every other day, first over the upper outer, then the lower inner, then lower outer and finally over the upper inner quadrant, this rotation was followed throughout the use of the extract. There was no reaction and practically no pain connected with the injections, which were always preceded by a few drops of a 4% cocaine sol. There was no change in the appearance of the eyes during this treatment, which was kept up for three months. The vision remained about the same. An iridectomy was done on the right eye or sympathizing eye with the hope that a clear coloboma would result, but unfortunately this was not the case, the coloboma almost immediately became obliterated by a fibrinous deposit. The final result is that the injured or excited eye is the better of the two, with a vision of 20/200 and a vision in the sympathizing eye of less than 10/200.

The second case is one of an adult, for whom I had removed the exciting eye 15 years ago and upon whose sympathizing eye, I had at the same time done an iridectomy with the usual result.

The ciliary extract was used in the same way in this remaining eye, for the same length of time when another iridectomy was done. The resulting coloboma gave him objective vision, he was able to recognize objects and even read large letters, so that on his way home from the hospital a week after the operation he could read large signs on the street, certainly a brilliant result from practical total blindness. But, alas, the coloboma soon filled with an exudate and shut out the light. I then removed the lens which was cataractous and shrunken, leaving a clear area for the passage of light, again his vision returned, but only for a few days, when an exudate again filled the clear area. The eye now gives some signs of becoming phthisical.

After a fair and persistant trial the conclusion is that the extract of the ciliary body has no therapeutic value; at the same time, case one, again emphasizes the fact that the exciting eye may eventually be the better eye. While case two emphasizes the fact that the removal of the exciting eye is frequently of no avail.

DISCUSSION.

Dr. Bradfield, LaCrosse, Wis.:—In wounds in the ciliary region, our first object should be, so far as possible, to get an aseptic wound, with as little traumatism and incarceration of any of the ciliary body as may be extruded. If there is no extrusion the wound should be cleansed thoroughly and as nearly coapatated as possible, and if there is any tendency for the wound to open, it should be closed with sutures. In sympathetic trouble, we make a mistake if we attempt to operate on the sympathizing eye until it has perfectly recovered from all inflammation which is usually not less than one year, and is usually difficult to do, when you have a blind patient who is applying for an operation to relieve his trouble. If the exciting eye is blind, it should always be removed as soon as possible.

Dr. Stueber, Lima, O.:—Dr. Cox made the statement that he had no longer the concern and anxiety in ciliary wounds as in former years. I recall that Dr. Fox, of Philadelphia, expressed much the same opinion at the New York meeting last year. While I was glad to hear this, I still cling to the belief that the ciliary region is a dangerous zone. The layman and the physician himself frequently judge the gravity of the case by the size of the wound. We all know that small punctures from pins or tacks not infrequently are quite as dangerous. A clean cut from a knife or scissor blade permits escape of fluids and may wash out the infection, which is less likely to occur from the prick of a pin or tack. It has occurred to me that in the latter case a paracentesis might be of some avail. The prognosis of such an injury depends upon the extent, location, age of the patient, and the time at which we see the case. Unfortunately, the cases sometime come to us a little late. Perhaps, there has been iris-prolapse, and it is a question then hat course to pursue. As for myself, I am always concerned in a case of this kind the first week or two. I believe the essayist spoke of ten days limit, but I think two or three weeks seems to be nearer the time. I recall reading Ramsey's excellent work on eye-injuries, wherein he states that true, sympathetic inflammation very rarely, if ever, occurs under three weeks.

Usually by that time one can judge as to what the outcome will be. If the organ is sightless, tension down, it is not wise to make further efforts at preservation of such a globe, although to sacrifice an eye, especially in a young woman, is a matter not to be treated lightly.

Dr. F. Valk, New York:—It seems to me whenever we have any discussion with reference to sympathetic trouble, that you never can tell what is going to happen. Referring simply to the case the doctor has shown there, I should feel if a case of that kind was presented to me that there was very little danger of sympathetic trouble, and if there was a prolapse, if nicely cut off and closed up, it would heal with little danger. On the other hand, there are injuries which may occur to an eye, in which we cannot tell how long afterwards we may have to consider an emucleation. I was impressed with that lately. About twenty years ago I saw a man in New York who had a piece of iron pass through his cornea, taking out a piece of the iris and lodging in the retina. Vision 20/15. I watched him for a year and still 20/15. He then came out West and remained several years, and during that time he had developed a sub-acute glaucoma in this eye. The eye was quiet, but no vision or percetion of light. He then came East and I saw him twenty years after the injury, and he had then an irritation in the eye that interfered with his work. I considered this a suitable case for enucleation, as I thought he would be safer if the eye was removed even twenty years after injury. So it seems to me when I see these cases of injury, the question I ask is, how deep and extensive is that injury, and can I restore that eye to be a useful organ? If I cannot, I am going to advise that man to have it removed at once. If I cannot restore useful sight, it should be removed. I believe in the old theory that this is the danger zone, the ciliary zone and if you have a lacerated wound enucleation is best.

Another case with lacerated wound of the ciliary region attempts were made to save the eye. At the end of ten days he had a violent sympathetic inflammation of the other eye and became blind. Had that eye been removed at once, without waiting ten days, they would have saved his sight. I do not believe in conservatism, if I think an eye ought to be removed, it should be done at once.

Dr. C. S. Means, Columbus, O.:—The great question of wounds in the danger zone being so much to be dreaded is not such a bugaboo as our friend Dr. Valk formerly impressed upon his students at old Bellevue.

I believe today that wounds in other regions of the eye are just as dangerous as in this ciliary region, or so-called danger zone. My experience with wounds of the globe has been that sympathetic irritations have occurred after wounds in various regions of the eye, and in great variations of time—from one week to fifty years.

I fully agree that large masses of scar tissue are dangerous, no difference where located, and also that there is more danger of prolapse in the region of the corneo-scleral region. This is always to be dreaded, and, as the essayist said, all prolapsing tissue should be carefully removed and the wound coaptated either by stitching or covered by a conjunctival flap. I remember one case, male, severe injury extending from cornea to back of equator. He refused enucleation and lost the opposite eye from sympathetic inflammation in less than three weeks.

Another, an injury when two years old, involving the cornea and iris. Sympathetic irritation fifty years after caused the offending eye to be removed with complete cessation of irritation in the opposite eye.

A third case. Small particle of steel in vitreous chamber, entrance well back; irritation two years after, fully recovered when offending eye was enucleated.

On the other hand ,there are numerous patients with extensive ciliary wounds with no trouble following. Some extended over a period of ten years, and there were many cases of steel, having entered through the lid and globe well back from the danger zone, and have, after successful removal, continued to be in excellent condition for a few months, when they gradually lost their vision from a low grade inflammation of the retina choroid. These when the foreign body entered through the ciliary region have in my cases been no worse than the others. Hence, I believe with Fox that the danger zone is over-estimated.

Dr. D. T. Vail, Cincinnati, O:—In dealing with the subject, "Sympathetic Ophthalmia:" I think we should cling to the teaching of our ancestors, those who taught forty years ago, and bear in mind we are dealing with two distinct classes of cases: 1st, the true "sympathetic ophthalmitis," which is an acute inflammatory affection, having its beginning in some mysterious way through an injury to one eye and manifesting itself in the other eye; and 2nd., "sympathetic irritation," which is non-inflammatory and more or less remote in its manifestations and very chronic. True sympathetic ophthalmitis is a sort of plastic pan-ophthalmitis, characterized at first by an extravasation of plastic lymph from the entire uveal tract or tunica vasculosa. This is a destructive disease resulting in phthisis bulbi. The other type, which has been confounded with this in the discussion here today, is that which comes on remotely in the history of the case and should be classified as sympathetic irritation, an entirely different proposition. In this the sympathizing eye never becomes red and sore, there is never acute inflammation of the retina and ciliary, but instead we see floating opacities, choroidal alterations, etc., while the patient complains of photophobia, ciliary pain or muscae in the good eye alongside an injured; which perhaps harbors a foreign body. These cases cause anxiety to the patient, but are not to be classified in a serious sense with the first type of cases, true sympathetic ophthalmitis. We should keep this classification well in mind in dealing with any case.

What rules can we lay down with regard to our conduct in cases of acute injuries in the ciliary region? A man comes to the hospital with a perforating wound of the eyeball. The ciliary region has been torn through. Some of the iris protrudes and the anterior chamber is full of blood; the eyeball is soft and the eye is blind. Shall we take this eye out at once, or shall we give the patient time to see what can be done? The tendency has been to snap out the eye at once, but now that we have refined methods of diagnosis, we can definitely prove if there is anything within the eye. Probably the history is something like this: The patient was cutting a coil of wire and the cut end hits him in the eye. In such a case we have no fear of a foreign body being present, we have only to deal with a perforated laceration. I saw a case with these identical symptoms more than two years ago at the City Hospital. It looked to me like the eye should be removed. The man refused; we resorted to anti-phlogistic measures and were surprised and somewhat humiliated to find that the hemorrhage was only in the anterior chamber. The blood resorbed in two or three days and the vision was restored perfectly. I was then reminded of the rule, based on a careful study of hundreds of reported cases ten years ago, a rule I had temporarily forgotten; **I could not find on record at that time a single case of true sympathetic ophthalmitis that had ever developed before ten days after an injury and never a case later than seven weeks.** If this is a working rule, we have something to go by. We can temporize at least two or three days and give the eye time to recover from the temporary shock, and we are often pleased to find that things are not so bad as they seemed. We should, however, keep such cases under strict surveillance for seven weeks following the injury before we turn them loose.

Dr. Lamb, Washington, D. C.: I would like to open what I have to say with the remark that every case is a law unto itself. These cases must be decided on their merits and with the experience of the man seeing the case. In that connection I will recite a case. Of course cases in which iron and steel have entered the eye and set up a chemical process are much more dangerous than where it is glass.

A boy in the country was injured in both eyes, cut across both cornea and limbus due to throwing of stones and broken bottles. He had been dragged in on a wagon and brought to me two days later. The question arose as to what to do about these eyes; both injured and injured similarly. I felt at sea. Dr. Suker has suggested the necessity of closing the wound with conjunctival flap and this was done in this case, a portion of the conjunctiva overlapping the cornea. You get rapid agglutination and the wound is practically closed. The boy has some vision in both eyes, and is able to drive about.

The other case was an Italian boy, cut by glass from an exploding pop bottle, the glass cutting clear across. My first advice was that he enter the hospital and wait a few days, the chances being he would have to have the eye removed. He refused the hospital and I treated him at home with eserin, hot applications, and drew the iris as far as possible from the wound. Now that man has 6/5 in the eye. It has been six years and he has not had further trouble. I treated it afterward with atropine and kept the iris loose as far as possible. Of course six years is nothing in the light of what Dr. Valk has told us. I know of a case where a percussion cap entered the eye twenty-five years ago. I removed the eye five years ago because of inflammation in the other eye. There are a number of these cases that may be temporized with without jeopardizing the other eye, providing the patient is kept under close observation.

Dr. Lichtenberg, Kansas City, Mo.:—There are injuries in the region of the ciliary body which are not followed by irritation or inflammation. The irritation, in my opinion, is the initial stage of the inflammation. This is very little spoken of in any of the text books. Fuchs does not mention it. I wish to report a case. An engineer, aged 36. An explosion of a glass tube of the guage. Injury at about the limbus, down and in at about an angle of 45 degrees; healed kindly under ordinary antiseptic treatment, but he claimed a progressive blindness coming on in the opposite eye. The injured eye had very good vision, so I hesitated for a long time to enucleate, but finally when the vision had gone down considerably I removed the injured eye and the vision of the other improved. These cases are seldom mentioned in the text books.

QUESTION:—How explan the recovery of vision?

Dr. Lightenberg:—Many of these injuries we get in the ciliary region can be explained that in the scar we have the nerve endings, long and short ciliary nerves. Possibly the transfer through the ciliary nerves may be the explanation. I have no explanation. It remains unproven.

Dr. Stueber:—Dr. Vail said the inflammation comes on in ten days to seven weeks. Does he except eyes that have foreign bodies within?

Dr. Vail:—No.

Dr. Bradfield:—I have a case occurring eight months after the injury.

Dr. Vail:—I only want to say that after an eye has been injured, the tendency is for an oculist to call everything in the other eye "sympathetic." If a person has sustained an injury in one eye and develops any symptoms whatever in the other eye, no matter how remotely, it is said to be "sympathetic ophthalmitis." This is not true, for we know all kinds of inflammatory and non-inflammatory troubles develop in eyes, the fellow eye never having been injured, and we know they are not sympathetic. But if the fellow eye has ever been injured, we are apt to call everything "sympathetic ophthalmitis."

Dr. W. L. Dayton, Lincoln, Neb.:—Dr. Vail's remarks can be misconstrued by the younger members. What would he do in two cases which I recall? One, a lady of 45, having lost her eye when a child, had sympathetic irritation, photophobia and inability to see objects, haziness, dotted opacities; and, upon removal of the injured eye I found a bony chorioid which was afterward examined by Dr. Hotz and pronounced by him true bone. Here was a case causing sympathetic irritation thirty years after the ulceration from which the eye was lost. Recovery of fellow eye followed removal.

Another case, a prominent attorney of our city, injured thirty years before, sympathetic irritation came on with lacrymation, severe photophobia and pain, and upon removal of the other eye this disappeared as in the other case. These two cases were undoubtedly sympathetic irritation due to injury of the fellow eye.

I wish to say that it is the conservation of the good eye, for every eyeball that is sightless or has been injured to be taken out. I believe you will be doing the correct thing by your patients, when you advise them to watch it and have it taken out on the least provocation, if they will not have it taken out at the time. I believe it from my experience of thirty years, and I believe you will be doing the correct thing by your patients, when you advise them to have it taken out at the time .We must protect ourselves, and for that reason I tell every case of severe injury of the eyeball that they should watch it and watch the other eye, not only for tenderness in the injured eye, but for blurring of the sight and excessive tearing in the good eye. I think there are more cases of irritation than true sympathetic ophthalmitis.

Speaking of the posterior segment inflammation, reminds me of a track-layer; a piece of iron flew into his eye and he refused to have the eyeball removed. It was before the time of the Hirschberg magnet. He refused enucleation absolutely. He returned in a few months with a sympatehtic irritation and he then had the eyeball removed. In two or three months he had a cataract form in the good eye; to what was this due? This eye had received no injury. Whether it was due to the nourishment of the lens being interfered with I can not say. I made an iridectomy and extraction of the lens, and he is able to see to make brooms, and support his family. Here was a case that puzzled me as to the cause of this cataract; the eye had not been injured and only the sympathetic condition presented; blurring, photophobia, lacrymation, etc., due to the foreign body in the fellow eye.

The best policy, in my opinion is to advise removal of all sightless eyeballs from the orbit.

Dr. Heckel, (closing):—I would like to say a great deal, but as there has been so much said I will make my remarks brief. I believe the best way to cure sympathetic ophthalmia is to prevent it; if necessary, remove the injured eye before it becomes the exciting eye. During the discussion a great deal has been said about sympathetic ophthalmia and infective ophthalmitis or pan-ophthalmitis and unfortunately these conditions have been confounded and the terms have been used synonomously. I have seen very few cases of true sympathetic ophthalmia, fortunately I have seen but two cases which I had treated originally. True sympathetic ophthalmia does not bear the ordinary ear marks of inflammation; there is practically no circumcorneal injection, the eye is quite pale, the cornea quite clear, the pupil contracted and the pupillary space filled with a deposit of fibrin, the iris has lost its lustre, the tension decreased and the vision very much reduced; such was the picture presented by both of these cases. The first patient was not operated upon for an iridectomy until about nine months after the injury and after three months use of the ciliary extract, yet the result of the iridectomy was nil, the coloboma rapidly filled with fibrin and shut out the light.

Dr. Reynolds, (closing):—My paper was on injuries of the ciliary region and not of the posterior segment of the globe. My citation of cases was designed to contradict the radical position assumed by some. In closing wounds of the ciliary region, any protruding portion of iris should be drawn out and snipped off. Any protruding portion of either the ciliary body or the choroid had best be returned by closure of the walls of the globe with Lambert sutures. I turn the conjunctiva back and introduce a curved needle, armed with sewing silk, into the capsule on opposite sides of the wound, closing the wound firmly. With a well-tied Lambert suture, I cut off the ends, close to the knot, and slide the divided conjunctiva back into position. I have frequently had the good fortune to secure, in this way primary union and good vision in the injured eye. If, however, you cut off any portion of the choroid or the ciliary body, you make a serious complication, which will ultimately necessitate enucleation. In introducing sutures for the closing of the wounds of the eye-ball no attempt should ever be made to pierce the sclera.

THE ETIOLOGY, PATHOLOGY AND TREATMENT OF CONCOMITANT, CONVERGENT SQUINT.

LINN EMERSON, M. D.
ORANGE, N. J.

That comcomitant convergent squint is so little understood by the laity, is the greatest reproach to the medical profession and indirectly to us, the ophthalmic members of the profession, on account of our failure to teach the general practitioner more in regard to this disfiguring malady.

What is so conducive to tears in a girl, or profanity and blows in a boy, as the derisive appellation of "cock eye?"

Since practically all cases can be, at least, cosmetically cured, is it not a reproach to our profession that this is not more universally known?

That the general practitioner has failed to properly instruct the laity regarding this condition is owing to the fact that he has not an intelligent knowledge of the disease himself.

The ophthalmologist while discussing the subject before the various special societies has failed to bring the matter to the notice of the general practitioner in a manner to enlist his cooperation.

In my practice I see a procession of cases in which the family doctor is said to have advised 'leaving the child alone as he would outgrow it when older' and 'not to put glasses on such a small child' assuring the parents that when the child was seven years old a simple operation would bring about a complete cure' etc., etc., ad infinitum.

After seeing a small child with squint at a most favorable age for cure by orthoptic measures and explaining the obvious advantages of this plan of treatment, what is my chagrin to learn that the family does not care to undertake it, because it is discountenanced by their family physician.

Many times he quotes the opinion of some oculist of much greater age and experience who 'does not take much stock in that sort of thing.'

This condition of affairs is in some measure due to the fact that (as Worth so pertinately states) a single symptom is mistaken for the whole disease.

How many general practitioners are aware of the fact that there is any condition present, other than the abnormal convergence of the visual axes?

The prime causes, a defect of the fusion faculty and the presence of an error of refraction are little appreciated.

In a large percentage of cases there is also lower vision, due either to suppression of the vision of the eye not used for fixation, congenital amblyopia, or amblyopia ex anopsia.

As to whether deficiency of the fusion sense is always the prime cause of concomitant squint, I can only say to the doubters, that in a careful observation of some 500 cases I have never seen a case in which this faculty was not deficient or absent.

It does not seem to me that Worth does his theory justice, since he does not clearly differentiate the fusion center, and the fusion sense or faculty.

Duane, in Posey and Spiller (page 182) specifically refers to a fusion sense, and a fusion center.

As we have a speech and an auditory center, there is no question in my mind that we have a fusion center.

The presence of this center is obviously necessary for the development or manifestation of a fusion faculty.

But its loss or absence is not the only cause which will produce deterioration, or loss of the fusion faculty.

Given congenital, orbital, or muscular abnormalities, congenital, or acquired amblyopia, anisometropia of high degree and the fusion faculty may fail to develop, even though a fusion center may be present.

In fact the rapid development of the fusion faculty after the correction of high degrees of refractive error and the inauguration of fusion training, and also its deterioration in some cases after cessation of proper treatment, point to it as a developmental faculty.

Worth arbitrarily divides the fusion faculty into three grades, but in reality there are many varieties or grades and I emphatically affirm that in all cases of concomitant squint this faculty is in some degree deficient.

Why does the esophoric patient, no matter how great his refractive error, so seldom become an esotrope?

Because his fusion sense is so well developed.

To my mind it is a misnomer to refer to cases of heterophoria as latent squint.

No doubt some cases of heterophoria are cases of latent squint but a majority of them have good fusion sense and will never become squinters.

The structural defect, or the refractive error may be the cause of the lack of the development of the fusion sense, but the deficiency of the fusion sense is the cause of the squint.

A clear understanding of this point would to my mind reconcile all the conflicting theories as to the cause of squint.

As to the statement that Worth's theory does not explain divergent strabismus occurring in myopia from the seventh to the twelfth year, after the development of good fusion, I would say that as the fusion sense, is a devolpmental faculty, and capable of marked improvement by training, so is it capable of rapid deterioration, and my own observation has shown that while these cases have early diplopia there soon is suppression of one of the images and a rapid deterioration of the fusion faculty.

I desire to repeat that I have never seen a case of squint (other than paretic) in which the fusion faculty was not deficient or absent.

As to treatment I feel it is our duty to permit no opportunity to escape for driving home to the general medical profession the fact that no child is too young to begin treatment for convergent squint.

To that end, I would urge the members of this society to avail themselves to all opportunities to read papers and present cases before local, county and state societies.

Cases seen during the first few months of life should have a weak solution of atropin instilled in the fixing eye two or three times a week, but should be observed at occasional intervals as I have seen two cases in which the atropin was continued for a long period without advice, and the squint transferred. The prognosis in these very young children should be guarded, as Posey has pointed out, since in many instances there are congenital or traumatic conditions (from birth injuries) which preclude the acquisition of good vision or the cure of the deviation, by methods other than operative.

While I have succeeded in a few instances in prescribing glasses under one year of age, I generally wait until the child is 16 or 18 months old and sometimes am obliged to postpone until even older.

If treatment can be begun before the age of four the prognosis in uncomplicated cases is good.

I give full correction in fixing eye and + .50 D. S., less in the squinting eye. 1% atropin solution is instilled in the fixing eye every morning and the occlusion pad is used from one half to three hours daily.

As soon as the child is old enough, the amblyoscope is used in the office and the stereoscope with Krolls' or Wells' pictures in the home. I have also found the plastograms of value.

Acting on some suggestions from Dr. N. M. Black and myself, Hardy & Co. have made a series of pictures for the amblyoscope which are more interesting to children than the ones sent out with their first pattern.

Dr. Black has also devised a most ingenious method of illuminating the slides of the amblyoscope.

As the case improves it often becomes necessary to put a drop of atropin in the squinting eye at less frequent intervals than in the fixing eye.

In these cases and in the alternating cases in which I use atropin in both eyes I have found that bifocals (+ 3.00 D. S. pasters) lessened the squint and accelerated the cure.

As to the percentage of cures by this method of treatment, it is not possible to make a fair estimate.

After treating several hundred cases in both priavte and dispensary practice, I should say that about 50% are not cured because of failure to carry out the treatment. In view of this fact I now advise operation much earlier than formerly in cases where the social condition and intelligence of the family does not seem to promise active coorperation.

In private practice, however, patients of good social condition who carry out the treatment with intelligence and perserverance, practically all get well.

Recently, I have been much impressed with the value of the combined plan of treatment in which the operative procedures are performed relatively early and the orthoptic treatment continued.

As to the operation selected and the time of its performance, there can be no hard and fast rules.

Age of the patient, the social condition, the amount of vision, the amount of deviation, and wishes of the family must all be given consideration.

There can be no doubt that advancement is the safest and wisest procedure, but whether on one or both eyes can only be decided at the time of operation. Double advancement will not correct all cases and frequently must be followed by a guarded tenotomy.

I have been doing Landolt's operation as modified by Wootton for several years but recently devised an operation, which I shall call the "split tendon operation" which seems to give me more satisfaction.

Its principle advantage is that it can be performed under local anesthesia and if after the operation is completed, sufficient effect is not obtained an extensive a tenotomy as is necessary can be performed at the same sitting.

No scleral sutures are used.

After cocainization, the conjunctiva overlying the insertion of the superior, inferior and exernal recti is raised and two or three drops of 2% cocain or alypin solution is injected at their respective insertions. The conjunctiva is opened by a long vertical incision at the outer corneo-scleral margin.

Above and below it is extensively undermined as in the Mc-Reynold's operation for pterygium.

The muscle is freed and taken up on a hook or with the Prince forceps.

About two millimeters from its insertion, a double threaded silk ligature is passed through the upper half of the tendon from within outward, forming a loop on the under surface of the tendon.

A similar ligature is passed through the lower half of the tendon.

These two sutures are passed in the manner usual to most advancement operations with the exception that they are far forward in the tendon and not in the muscle.

The tendon is now dissected from the globe as closely as possible thus carefully preserving the tendinous ends which prevents the sutures pulling out, as often happens when the tendon is cut off.

The cut end of the tendon is now split longitudinally 4 or 5 millimeters and the halves are anchored above and below, underneath the undermined conjunctiva. This is done by passing the two needles on each suture far under the undermined conjunctiva and tying the ends over the narrow bridge of conjunctiva exactly as is done in the Mc Reynold's operation for pterygium. As the conjunctiva forms little or no anchor for the muscles, one of the needles is now passed deeply under the tendon of the superior or inferior rectus, after it has been raised in the strong grasp of a fixation forceps. The suture is now drawn tight in the form of a loop around this muscular tendon and each half of the split tendon closely approximates the tendon of the rectus to which it is anchored. As in all muscle operations, the effect of the operation cannot be foretold.

This operation, performed under local anesthesia, possesses, the advantage that the immediate effect is the ultimate effect as there is little probability of the stitches pulling out. If the effect of one advancement is not sufficient, the second eye may be at once advanced. If after this, still more correction is desired a careful tenotomy of one or both opposing recti may be performed.

In one or two instances I have slightly increased the effect of the advancement by putting in a scleral suture at the corneo-scleral margin this suture including the conjunctiva as well as the middle portion of the muscle.

I have performed this operation under local anaesthesia in children as young as five years. I am now aiming to get all the correction desired at one sitting. The after treatment consists of atropin and occlusion of both eyes for one week.

Of various other operations I have little to say. In the hands of operators who are familiar with them, they no doubt bring good results. I must, however, confess to a fixed prejudice against Panas' stretching operation. This prejudice is founded on the observance of divergence following it in four or five cases in my own practice and the observance of about a dozen similar cases after operation by other surgeons.

DISCUSSION.

Dr. Lightenberg, Kansas City:—I wish to endorse every word Dr. Emerson has said. Where the physician has given the advice to make correction later on, it has been my practice since 1908 to make every effort against this. As for the operation, I believe the operation the operator finds best in his hands is the one for him to do.

Dr. Edward Jockson, Denver, Colo.:—The operation that Dr. Emerson has just described varies a little from that which has been done by Pucha, in that he carries one of the stitches into the tendons of the superior and inferior recti muscles, although sutures have been so placed by Howe of Buffalo and others. I have been very much impressed in going over the subject of advancement operations, with a feeling that we are in a stage with regard to advancement operations that the profession was in with regard to tenotomy thirty years ago; and, our final judgment on the safety and reliability of these operations will not be reached until there is brought together a list of failures and a report of eyes made worse by them. Such cases exist, and we will see more and more of them. Not that advancement operations are to be superceded, or that we are to go back to tenotomies. By doing advancement we escape certain dangers of tenotomy. But if it is not done with more intelligence and with a better understanding of the general questions involved and the particular conditions of the case, we will make failures, as serious and in some cases more serious. Landoldt, who has advocated advancements as against tenotomies, has a picture of one of the frightful results of tenotomy. I want to see published some of the bad results of advancement too. Advancement has been done where union of the muscle has failed to take place, with the resulting condition worse than before the operation was attempted. I believe there is an error of complexity in advancement operations, that we will have to get away from. There are a great many elaborate stitches, which do not seem to accomplish anything of value that cannot be accomplished with a more simple stitch. This one is comparatively simple which Dr. Emerson has suggested, and in that respect superior to some of those that have been proposed.

Dr. L. Connor, Detroit, Mich:—It occurs to me to ask Dr. Emerson how much knowledge is necessary to understand this proposition, can be taught the family physician. Is there anything that he can be taught which will enable him to give wise advice to the families with which he is connected? Clearly the operative procedure is quite beyond his scope, as we all know, but at the present time it is not the custom to teach him anything. He does not know anything and is consequently not in sympathy with anybody who does know something. I think, myself, that he might be taught something and that something might put him in sympathy with the specialist who will do the operation and the finer technical work associated therewith and so co-operate with the specialist in solving the peculiar problems presented by each case. All of us have sometimes obtained excellent results and other times not so excellent, but it is pertinent to ask what the family doctor may do with the ninety millions of human eyes in the United States? Can he do anything to benefit these squint cases by bringing them into sympathetic touch with the gentlemen who are here?

Dr. Lamb, Washington, D. C.:—I would like to understand two points; as it seems to me there is a big chance here for torsion, and the second is, what is the object of the two stitches being tied, as he ties them one in the conjunctiva and the second through the muscle? Why cannot one needling of the muscle do the whole, instead of tying one and then making a second tie?

Dr. Willis, Indianapolis:—I would like to ask the essayist about the mechanical part of this operation. Is the muscle divided between the capsule of tenon?

Dr. Emerson:—No, cut close to the sclera. I expose the muscle freely.

Dr. Willis:—Then it passes out attached to the conjunctiva. You are attaching the tissues to a line between the conjunctiva, and I should think you would have, unless you anchor it to the rectus, a disagreeable feeling in the eye and also some deformity. Of course this stitch goes out through the external capsule and passes out underneath the conjunctiva.

Referring to non-operative treatment, there are very few exercises, or, rather, very little paraphanelia to use for the fusing exercise. You have used the Worth amblyoscope and Emerson exercises, but I have been fortunate in getting some material which is very good, formulated by the Underwood and Underwood Company of New York. They are stereoscopic pictures made by two lenses, so that you get a picture that has a most distinct perspective. The Underwood & Underwood Company this week very kindly sent to me several hundred of these pictures, allowing me to make a choice of some I thought would be excellent for instructions in fusion sense. They have many of them with interesting anatlytical reading and maps so that they are not only pretty instructive, but absolutely fascinating to the child in teaching the fusing sense.

Dr. Windell Reber:—Strabismus in children under six years of age should not in my opinion be operated on in the vast majority of cases. It is impossible to do the right thing scientifically by these cases without the use of retinoscope; and in these little folks this must be done not with a trial frame, but by binding off one eye with a Liebreich bandage and then putting the trial frame on the face. This axiom, laid down by Dr. Edward Jackson fifteen years ago can be made more emphatic than ever, inasmuch as fifteen years of experience confirms it.

The Worth amblyoscope is worse than useless for home treatment. For office treatment the modern double rheostat that permits rapid alteration of the illumination makes the ideal apparatus. There should be 12 sittings, of an half hour to an hour each, extending over four weeks. If at the end of this time there is no manifest improvement, the amblyoscope will be of no particular benefit in that particular case.

Deeper study of these cases will reveal more that are due to obstetric injuries and congenital palsies. The vast proportion of the cases that come to us, however, are made up of the two factors, high unequal refractive error and a weak fusion faculty.

When operation is decided on, I am persuaded that the operator who does not estimate the rotations of the eyes is defrauding himself of something that he should have. The tropometer of Steven's will furnish information that will often surprise him. If there is vision of 5/20 or more in both eyes the surgery should be divided between the two eyes. Whether it shall be combined tenotomy or combined advancement, the study of the rotations will have to decide. If there is vision of less than 5/25 in one eye, the surgery should be confined to that one eye.

Dr. Emmerson, (closing discussion):—As our president has just said, there are no two cases just alike, and the rotations should be studied.

The first question is how I fit small children. It has been answered by retinoscopy, which is the only way. I have devised a modification. I work at half a meter. It is the length of my arm, and I can take the skiascope in the left hand, some one holding the baby. I deduct + 1.50 S. instead of + 100 S. At a half meter, often times with a baby that is shy and does not fix at all well, with repeated examinations we can get an accurate fitting.

Another point was about the occlusion pad three days at a stretch. My plan is dependent on the patient and the convenience of the mother.

As to the failures of which Dr. Jackson speaks, they are dependent upon subnormal rotations. I have a case I operated a short time ago; a girl had little rotation, but I wanted to test the operation and see what I could do. I operated on one eye, then the other, advancing both external recti, but there was little effect but I did her no harm. Having done two advancements and getting no results, I then did tenotomy and got a good result. I shall study her ultimate condition twenty years from now with great interest. I do not wish to say I oppose tenotomies. I have used them in three or four of the sixteen cases on which I have done my advancement operation.

Dr. Connor has asked how we shall teach the general practitioners anything. I do it by showing cases. I went to a meeting of our local practitioners society and read a paper and brought a number of these cases, some just beginning treatment and some well along and some cured and showed photographs taken before anything was done, and paraded these cases and told them what could be done and explained the treatment, and told them if they would send their cases to some man who would do this kind of work and take pains, they could be cured while still young. The results were astonishing in the number of cases sent me to my office and my clinic in a short time. The school nurse and inspector are the ones who do the best missionary work. I lecture to them once a year and I show them these cases and what has been accomplished, and there is nobody doing such good work in sending these cases to the clinic and getting them to come and take up this treatment as the school nurse.

With regard to the question of torsion, when you get to the point where you have got to do an advancement it is a confession of failure; it makes no difference whether you have torsion or not. After all, the operation is largely cosmetic. A certain per cent may get some fusion but the majarity of them are done for cosmetic reasons and the question of torsion is not important, because without fusion it makes no difference how much torsion is present because there will be no subjective symptoms.

I was asked why the stitches are put through the conjunctiva and then later through the muscle. (Illustrates at board.) I tried putting the stitch through both at once but found I could not tell when the muscle was drawn up closely underneath the conjunctiva.

Many of my patients have Underwood's pictures and they are excellent. I urge all of them to get stereoscopes and stereoscopic pictures.

SOME EYE COMPLICATIONS OF ACCESSORY CAVITY DISEASE.

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BALTIMORE, MD.

During the past few years so many articles have appeared on the eye in connection with the accessory cavities, it seems almost superfluous to add another to the list. The obscure symptoms in many cases and the difficulty often of diagnosing the cavity involved made the subject one of absorbing interest to the ophthalmologist and the rhinologist. In no class of patients is relief more prompt if treatment be instituted early.

In studying eye complications of sinus disease, specialists have divided themselves into two classes: those who believe that all obscure eye troubles have their origin in the sinuses and those who go to the opposite extreme of asserting that such complications are rare. In my opinion these two extremes are due to the fact that ophthalmologist or the rhinologist is apt to devote himself to his own specialty and to neglect the claims of the other from an etiologic standpoint. The man who perfects himself in the anatomy and physiology of the eye and the nose and knows how to interpret the possible changes in the fundus and the significance of pus or pathologic conditions in the nasal fossa will reach that conservative middle ground which I feel is the proper one in studying our subject.

Only a few years ago a prominent ophthalmologist expressed the opinion that the Killian radical frontal sinus operation should be performed only by an eye specialist because by training he was better conversant with the parts involved. In answer to this it may be said that the nasal part of the operation is of some practical importance and whoever does it must have a good working knowledge of the eye and the nose.

The eye complications of sinus disease which I have seen have, as a rule, been of rather serious type and in most of them the results of treatment were gratifying. Some years ago Dr. H. Harlan referred to me J. B., colored, who had exophthalmos of the left eye. He had had no previous illness. He stated that the eye had begun to project a few days before and had gradually grown worse. At the time of his entrance into the hospital the exophthalmos was so pronounced that the lateral muscles did not act at all while movements above and below were very slight. There was no oedema of the lids or conjunctiva. The patient complained of pain in the upper part of the eyeball especially on pressure and headache over the eyes which was worse on blowing the nose. On palpation nothing abnormal could be detected in the orbit. From the rapid development an acute trouble was suspected. Dr. Harlan diagnosed typical choked disc with vision diminished. After the application of cocaine and adrenalin pus was seen between the middle turbinate and the outer wall of the of nose. The following days the same treatment was repeated with a free discharge of pus each time. With the first outflow of pus the eye began to improve and in three days was almost normal. One week after beginning treatment the eye had returned to its normal position and all movements were free. The choked disc rapidly disappeared.

What was the mechanism of the exophthalmos in this case? Since there were no symptoms of orbital abscess and drainage cured the condition, it must be assumed that the accumulation of pus in the frontal sinus and ethmoid cells caused a bulging of the thin bony walls with pushing forward of the eyeball. Schmiegelow and Jacqueau have reported similar cases. In Schmiegelow's case there was acute frontal sinuitis. Both smyptoms disappeared in fourteen days.

An Italian woman came to the Presbyterian Hospital in April 1907 with marked exophthalmos, the eyeball projecting down and out. All movements were abolished and vision diminished. The patient was referred to me from the eye department. The trouble dated back several months and began with headaches. In the upper lid about one cm. from the inner canthus there was a fistula 2 or 3 mm. in diameter which led to necrotic bone in the ethmoid region. The nasal cavity was filled with foul smelling pus which came from the space between the middle turbinate and the outer wall of the nose. A diagnosis of exophthalmos from disease of the frontal sinus and ethmoid cells was made. Owing to the fact that she was eight months pregnant, no operation could be performed. After the birth of her child she consulted Dr. J. F. Crouch who operated externally with good results.

In November 1907 Miss McK 17 years old, was referred to me for nasal examination by Dr. H. Harlan who could find no orbital cause for pronounced exophthalmos of three years duration. When the eye began to project her parents took her to an oculist who, unable to find a cause for the trouble, sent her to a rhinologist for examination of the accessory cavities. The latter found nothing. The patient later consulted another oculist who acknowledged his inability to diagnose her case. The history was interesting in that it seemed to point to some trouble in the nose. Whenever an acute coryza developed, the exophthalmos was more pronounced and with the subsidence of the "cold," the eye receded to its former position but was never entirely normal. In September 1907 the patient contracted a severe "cold" which disappeared within a reasonable time but the eye which, as usual, became markedly exophthalmic did not recede but on the contrary grew gradually worse. When she consulted Dr. Harlan, exophthalmos was so marked that all movements were practically abolished. Vision was not affected. External examination failed to show any deformity over the frontal sinus or ethmoid cells. Percussion caused slight pain over the frontal sinus. There had never been headaches and a discharge from the nostril was denied. Intranasal examination showed a large middle turbinate but no pus either before or after the application of cocaine and adrenalin. I advised removal of the anterior end of the middle turbinate to facilitate drainage and treatment of the frontal sinus. Operation was accepted and the turbinate was immediately removed with Luc's forceps. There was a gush of a teaspoonfull of greenish foul smelling pus followed by a decided recession of the eyeball. After the operation no pus was fround in the nostril. In a week all tenderness had disappeared from the frontal sinus. The exophthalmos gradually decreased and in six weeks the eye was normal. Since recovery the patient has passed through several "colds" but the eye has remained normal.

In January 1907 Mr. R. 43 years old, consulted me for nasal catarrh of many years standing. For twenty years he had been treated from time to time for a discharge from the right nostril which was constant, thick and yellow or white in color. For some years the right eye had given him trouble. Being a professional man he was compelled to use his eyes a great deal which invariably caused blurring or indistinctness of letters. At first the trouble was slight but as time passed the symptom grew worse so that it became very annoying. He could not read for five minutes withing seeing "through a cloud." He consulted an oculist who told him frankly that he could find no cause for the condition. The fundus was normal and the muscles well balanced. Another curious symptom was a temporary double or treble vision. In watching a game of tennis he would sometimes see three balls instead of one. On advice of an oculist glasses were worn but no benefit. Vision finally became so poor in the right eye that large signs could not be read across the street. Vision was 20/40.

On examination of the nose a diagnosis of pus in the right antrum was made and confirmed on lavage. While I felt that there might be some connection between the poor vision and the antrum, I made no promises of improvement. A permanent opening was made in the antrum and the cavity was kept clean by daily antiseptic washings. With the improvement in the condition of the antrum, vision in the right eye gradually grew better. Eight weeks after the operation the right eye was actually better than the left. Up to the present time the patient has had no disagreeable eye symptoms. In this case it is probable that absorption from the antrum caused the eye trouble.

In February 1909 a colored man with exophthalmos was sent to me from Anne Arundel county, Maryland. He complained of headaches and was sensitive to percussion over the frontal sinus of the left side. Examination of the nasal fossa showed a trace of pus between the middle turbinate and the outer wall of the nose. Killian's radical operation was performed; the mucous membrane of the frontal sinus and the ethmoid cells was diseased. The patient did well with the exception of a fistula which formed from the breakingdown of the stitches. The exophthalmos gradually subsided. Becoming impatient the patient suddenly left the hospital before the fistula had healed. I saw him a few months ago and he was entirely well.

In October 1909 Dr. William Tarun asked me to see a boy, 5 years old, with exophthalmos, oedema of the conjunctiva and two lids and a fistula of the upper lid which led into the nose. At the operation which was done externally, the lamina papyracea was found practically destroyed. The ethmoid cells were cleaned out and the fistula curetted. In a few days the eye was almost normal and the boy left the hospital with some discharge through the wound which after a time ceased.

A little girl, 2½ years old, with orbital abscess came into the service of Dr. E. A. Knorr at the Presbyterian Hospital. At external operation which was performed by Dr. Knorr, we found that the pus had broken through the lamina papyracea. After cleaning out the ethmoid cells and draining the abscess, the child made a prompt recovery.

A Bohemian boy, 10 years old, came to the Presbyterian Hospital with orbital abscess of three days duration. Nasal examination revealed pus in the nose. External operation opened the abscess and showed breaking down of the lamina papyracea. The cleaning out of the ethmoid cells and the drainage through the nose resulted in recovery.

In December 1909 Dr. William Tarun referred to me Msr. F. D., 35 years old. Three weeks before she consulted him she awoke to find the vision in the left eye blurred. On looking in the mirror she noticed that the pupil was widely dilated. For two years she had been subject to severe headaches and since the blurring of vision and dilated pupil were preceded by such an attack, the family physican thought of glaucoma. She was sent to an oculist who could find nothing to account for the condition. He prescribed eserine for ten days but it had no effect on the pupil. In the meantime vision had decreased to light perception. Dr. Tarun diagnosed oedema of the retina and referred her to me for nasal examination. With the exception of a slight enlargement of the middle turbinate, the nose appeared normal. Externally there was tenderness over the antrum, the ethmoid cells and the frontal sinus. Feeling sure that there was an inflammation of the membrane of the frontal sinus and ethmoid cells with lymph stasis, I advised an operation. The antrum was first punctured and washed out, a small quantity of pus appearing in the water. The middle turbinate was then removed; the ethmoid cells were filled with a thick, gelatinous substance. The frontal and sphenoidal sinuses were washed out but no pus found. Two days after the operation the pupil was somewhat smaller. Eight days later the pupil was normal in every respect and the patient could distinguish colored lights. From this time on improvement was steady until six weeks after the operation the retina had cleared up and vision was 20/15. The patient returned home the middle of January apparently well. For two months vision was normal. She then contracted a "cold" which caused some blurring. I do not know her condition at the present time.

In January 1910 Mr. A., 49 years old, was referred to me by Dr. Hiram Woods for oedema of the upper right lid and tenderness over the frontal sinus. His symptoms began in November 1909 and at times pain was almost unbearable. January twentieth the patient was anaesthetized for the Killian radical operation. The frontal sinus was filled with pus and granulation tissue. On examining the walls of the sinus we found posteriorly an area of exposed dura covered with granulations, an extra-dural abscess. The wound was packed loosely and for a time the patient did well. He did not seem to recuperate from the operation as patients usually do. In February I was taken ill and the wound was looked after by Dr. L. J. Goldbach. Some time later he telephoned me that a suspicious looking growth had developed in the wound. Dr. H. Harlan saw the patient an agreed with Dr. Goldbach that an attempt should be made to remove the growth. Under ether they removed as much of the mass as possible; microscopic examination showed sarcoma. I did not see the patient again until June when the presence of a large, bleeding, granular tumor left no doubt as to the diagnosis. There was no evidence of a growth at the first operation so that it must be considered as a secondary phenomenon. The oedema of the lid gradually increased until it hung half way down the cheek. The patient died in August.

Mrs. R., 25 years old, was referred to me by Dr. W. K. White for left temple pain of long duration. The left cornea was surrounded by slight ciliary injection which the patient assured me was constant. She had great trouble reading and sewing. Nasal examination showed large middle turbinates on both sides and tenderness along the floors of the frontal sinuses. The diagnosis of catarrhal frontal sinuitis was made. Removal of the anterior end of the middle turbinate cured the pain and the red eye. Some time later the same symptoms occurred on the right side which necessitated the same operation on that side. The patient has remained perfectly well.

R. G., 11 years old, for some years had a bulging of the bone along the inner surface of the orbit extending from the floor of the frontal sinus to a point just below the innecanthus. There was profuse discharge of pus from the left nostril which necessitated the use of several handkerchiefs daily. The X Ray showed rarefied bone corresponding to the bulging. The movements of the eye were not interfered with. The trouble began as a mucocele of the ethmoid cells and later became of the ethmoidal cells did not stop the pus. The external opening of the ethmoid cells revealed a pus sac corresponding to the bulging bone. The trouble began as a mucocle of the ethmoid cells and later became infected. With the exception of headaches the patient's health was not seriously impaired. After the removal of the pus sac and drainage recovery was prompt.

THE ANATOMICAL RELATION BETWEEN THE SPHENOIDAL SINUS AND THE ORBIT.

OBSERVATIONS UPON 100 SKULLS.

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In a paper read before this Society in September, 1908, the authors presented a number of specimens pointing out the anatomical relationship existing between the sphenoidal sinus and the optic nerve and commisure. At that time, as well as in a general study of the sphenoidal sinus by Dr. Gibson presented before the American Medical Association in June of the same year, attention was called to the fact that some of the specimens showed diverticula which approached or invaded the obital wall, and also that certain definite groupings of sinus were possible, based upon its position in the body of the sphenoid. These studies stimulated us to further investigate the relationship between the orbit and the sinus, in view of determining in an antomical way, what, if any bearing, affectious of the latter might have upon these structures protected by the former.

The specimens upon which the following observations were made, are in the main those which were presented in the two papers above-mentioned, and in addition, some new material which has come into our hands since those studies.

These specimens have in large measure been taken at random from the dissecting room of the University of Buffalo, while a few more were obtained from private sources. In collecting the material no attention has been paid to race, sex, previous history. The specimens are "dry," that is to say, all soft tissues and membranes have been carefully removed and the bones thoroughly dried. In the above respects as well as in reference to age and sex the material of these three papers is uniform.

In making observations upon thickness of the bone separating the orbit and sinus it has seemed best to divide the walls into two classes: 1, Thin, and 2, Thick. By *thin* is meant any wall measuring .5 millimeter or less, and by *thick* is meant all walls measuring over .5 millimeters in thickness. While this figure is an arbitrary one it was chosen because readily estimated, and seemed on the whole a fair working basis from a clinical standpoint. Where it has been possible to saw without destroying the specimen, actual measurements have been made by means of a carefully graduated steel rule. Otherwise the thickness of the wall has been judged by its light transmitting qualities, as compared to plates of bone of known thickness. In our experience the latter method is as reliable as the former. As formerly, in cases of doubt the measurement was *over* rather than *under* estimated. Consequently whatever data is herein presented is conservative. The thinnest portion, for obvious reasons has always been measured.

In the series of specimens upon which the following observation are made the male sex predominates. The skulls are those of adults of various ages, the general average being somewhere near forty-five years. The nationality in most instances is unascertainable.

In casting over the material in search for some working basis from which intelligent observations might be made, two anatomical conditions and one problem have presented themselves:

1. Projection from the sinus of diverticula which approach or even invade the orbital wall.

2. Those types of sphenoidal sinus placed so far forward in the body of the sphenoid that the external wall of the sinus becomes in part the inner lateral wall of the orbit, and

3. What are the possible avenues of communication between the orbit on the one hand and the sinus on the on the other?

Diverticula. In a trifle over 23% of the specimens at our command diverticula of various dimensions were found which approached, or actually invaded the orbital wall. These range from a comparatively small dimpling in the sinus wall to a very sizeable, cavernous-like prolongation extending well toward the orbital wall, so that a relatively thin plate of bone separates the orbit from the sinus. Of these 23 specimens, 17 showed diverticula whose walls at the point of contact with the orbit measured, .5 millimeter or less in thickness. Estimated in ratio to the entire series, 17% may be classed *thin* according to the basis of our measurements. However, 8 of these specimens also present a common wall with the orbit of such thickness as to be classed by us as *thin*, consequently to avoid repitition in our percentages we have counted only the remaining 9, whose sinus cavity is either not in contact with the orbit, or whose walls are classed by us as *thick*. Reduced to the basis upon which the classifications to follow are computed this percentage is 4½%.

Your attention in this connection is especially invited to Specimens No. 7, N. R. 22, No. 24. Upon inspecting these particular specimens more closely certain mechanical features immediately occur to an observer. Indeed it seems to us that the most striking one is that of mechanical drainage. A diverticulum such as is seen in Specimen No. R. 25, is so placed that in the erect position of the head, it is the lowest level of the sinus, toward which any products of inflammation will naturally gravitate and in which it will collect and remain undrained. In other words, such a diverticulum will readily harbor an accumulation of infective material holding it in close proximity to the orbit and its contents.

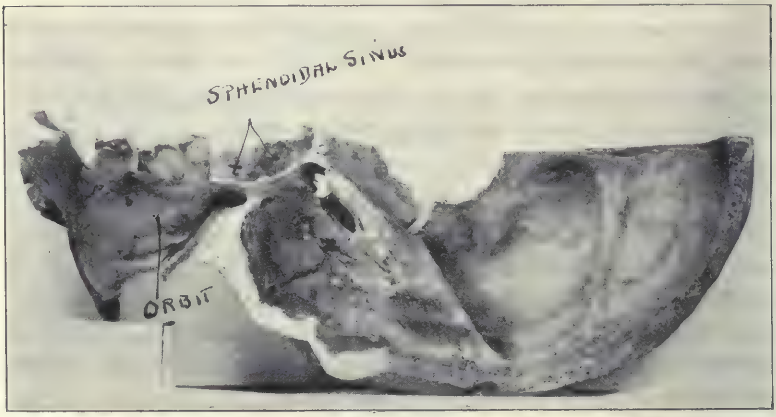

Fig. 1.—A specimen of a sinus anteriorly placed so that the sinus and the orbit have a common wall.

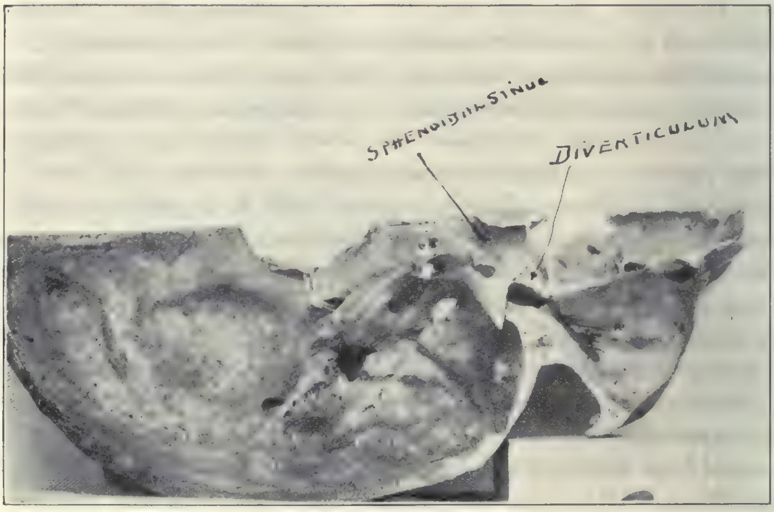

Fig. 2.—A specimen showing how the sinus is brought into relation to the orbit by means of the diverticulum which is indicated. The wall of the diverticulum has been sawed obliquely thus accounting for the apparent thickness.

Sinuses having a wall in common with the orbit. In the papers quoted at the beginning it was shown that as regards position in the sphenoidal bone, sinuses might be grouped into three classes:

1. Those occupying the entire body.
2. Those occupying the anterior and superior part of the body.
3. Those occupying the central portion of the body.

Besides the above are a very few (4%) in which the sinus is either totally absent or placed latterly.

Obviously we are concerned in this study with only groups 1 and 2, namely, those occupying either the entire body or those placed anteriorly. However, over 60% of the specimens we have examined come under these headings.

It is quite manifest, that if there be any relationship between sinus disease and secondary orbital affection, the largest factor therein is one of proximity and contiguity, and the index of our work is of necessity based upon the thinness of the wall common to orbit and sinus.

Blood and lymphatic supply. Because of the insurmountable difficulties of satisfactorily injecting specimens, the avenues of communication between the sinus and the orbit have not been made out. Certainly as far as we are able to determine there are no blood vessels of microscropic size communicating between the orbit and sinus. Likewise nothing is known of the arrangement of the lymphatics. Of necessity, therefore, most notions regarding them are speculative. Without being able to offer any more substantial proof than an opinion unconfirmed, we venture, however, as our own belief that there may be the same relation existing between the lining membranes of the orbit and the sinus, as exists between the scalp and the meninges, where a thick plate of bone is interposed, and where a definite avenue of infection exists. If there be a way in which infection may travel from sinus to orbit we think it likely that the veins and lymphatics are the carriers.

In estimating the following percentages, we have observed 100 skulls. Of this hundred, sixty-five have come within the scope of this paper, that is to say, sixty-five of the skulls have presented either diverticula encroaching upon the orbital wall, or their sphenoidal sinuses have been placed far enough anteriorly in the body of the bone to have a wall in common with part of the orbits, or both.

Of these two groups nearly 55 percent (54.472%) have walls .5 millimeters or less in thickness. Computed on the basis of the total number of skulls examined, 33½% have walls of .5 millimeters or less in thickness.

If our specimens can be taken as indicative of a fair general adult average, one-third of individuals have orbits separated from sphenoidal sinus by a wall .5 millimeter *or less* in thickness. Such an anatomical arrangement immediately suggests the possibility of a morbid process in a sinus of this type, becoming an exciting factor in disease of the orbit and its contents. Through the thin wall common to both cavities infection by contiguity is made possible.

Comments. Although the observations and percentages are upon 100 skulls, really 200 specimens have been examined. As a matter of fact there is no apparent symmetry between the two sinuses. Because there is a diverticulum on one side does not mean that there is a corresponding diverticulum on the other. Indeed, a bi-lateral diverticulum has but rarely been observed. Also, one side may be thick towards orbit and the other thin, as for instance in specimen No. 66.

In our observations account has not been taken nor has anything been said concerning dehiscences. The nature of our material has been such (being "dry") that data under these circumstances is unreliable. The authors feel however that dehiscences likely play an important role in the living subject.

Conclusion. A purely anatomical study of this sort carries with it no clinical data, nor can it go further than suggest more or less vague clinical relationship. However, it may point a way toward an analysis of some obscure orbital trouble or at least suggest one more factor to be considered as a possible source of orbital inflammation. The authors feel as far as actual possibilities are concerned, they have convinced themselves at least, that a diseased sphenoidal sinus of the type we have described or a sinus presenting a large diverticulum encroaching upon the orbital well, can be, and likely is, a source of menace to the orbital content with which it is in juxtaposition.

The point which our data most emphasizes is this: About 38% of normal orbits are separated from their corresponding sphenoidal sinuses by a relatively thin wall. This relation is brought about either by a diverticulum extending from the sinus to the orbit or by a sinus anteriorly placed in the body of the sphenoid, or by both.

DISCUSSION.

Dr. J. M. Ingersoll, Cleveland:—The rudimentary structures, we all know, vary a great deal more than the structures which are not rudimentary. The diverticula in the specimens which Dr. Francis has shown, are possibly rudiments of the larger sphenoidal sinuses in lower animals. If they are rudimentary, it would account in a way for their presence on one side and not on the other; we would scarcely expect to find the same rudimentary variation on both sides. So the various diverticula are perhaps rudiments of the larger cavities and of the constant diverticula that are present in the lower animals .

Dr. Wendell Reber, Philadelphia:—I wish to cite a case within my observation in the last month bearing on Dr. Francis' paper. A woman, Quakeress, 65 years of age, who had always enjoyed remarkable health, presented a unilateral optic neuritis, and at one time, for 3 or 4 days, symptoms strongly suggestive of unilateral thrombosis of the cavernous sinus on the same side. The symptoms were not perfectly defined, but it looked at any time as though she might go over into the typical picture of thrombosis of the cavernous sinus. Her general medical adviser was a far-seeing man, who had studied the case carefully. I suggested to him my fear of either posterior ethmoidal or sphenoidal disease. A most painstaking rhinological examination, repeated some four or five days after the first one, was negative. I was moved to urge upon the rhinologist the advice of Fuchs, that when the ocular symptoms are prominent enough, in spite of negative findings rhinologically, that the rhinologist should operate. I could not induce the gentleman to operate on the case; he said the findings were negative, and he didn't think they justified it. My position was a peculiar one, because he was one of our prominent rhinologists, and a friend of mine and the medical man. The lady was then sweated and purged within an inch of her life; atropine was given practically to toxic effect, and a nasal spray of antipyrin and adrenalin employed under which her symptoms improved remarkably. The vision improved; also the visual field, and there was distinct improvement in all the features of the case, especially as touching the optic nerve. I still urged upon the general medical man the wisdom of continued careful rhinological observation of the case. When the lady's condition improved so much under medication, they felt, I think, that I might be wrong. I said. "I believe this is only the therapeutic test and points more strongly to the correctness of my position." She improved so far as to resume her household functions; but one night after catching cold, as she expressed it, there was a sudden lighting up of all her trouble, she developed symptoms of brain abscess and very suddenly decided to die. I am glad to say that we secured an autopsy, and that all my suspicions were verified. I am moved to report this case because of the negative report of the rhinological findings, and of the intense gratification it was to me, in spite of the lady's death, to find that my advice to operate was right. I feel sure that all of us at times see such cases.

Dr. H. D. Rinehart, Dayton, Ohio:—The case reported by our chairman, calls to mind one similarly interesting. On March 12, 1909, a physician brought his brother to me for consultation. A brief history of the case was that the patient had been real sick with la grippe for three weeks and now was only able to be brought out and taken back. The man, aged fifty years, was anemic in the extreme; elevated temperature; most unbearable pain over the right frontal sinus, occipital region to right of median line equally tender and painful. The patient stating that when walking on pavements, he was compelled to hold his head with one hand over frontal and with the other over the right occipital regions, because of the intense suffering caused by the jar, when stepping on the pavement. The patient had the appearance of one very sick and loaded with some form of sepsis. Examining the nasal passages, I found condition as follows: muco-pus covering middle turbinate on right side, with hypertrophy of the turbinate; signs of pus coming from the right posterior ethmoid or sphenoidal sinus. From the very intense pain "complained of" in right posterior region, together with the appearance of the patient, and history given by his physician, I made a diagnosis of purulent sphenoidal sinuitis of right side, with possibly ethmoidal cells, posterior, involved also. I advised immediate operation for the evacuation of pent-up pus. The two physicians present concurred with the diagnosis, but the patient declared he was too weak and sick to undergo such a procedure and that I should do all I could for him until he was stronger for the operation. I told the patient that very probably he never would get better without the operation and that I regarded him in a dangerous condition; however the patient insisted that he could in no wise withstand an operation until he was a little stronger.

I saw patient daily until the morning of the 18th of March, when I was called by telephone that patient decided he could live no longer with the suffering he had been having and therefore wanted me to operate at once. I arranged for the same; and when I reached the sphenoidal, I found granulation tissue filling the normal opening to sinus and pus covering the same. On opening the sinus, the pus under pressure was thrown out of tne nasal passage and flowed over the upper lip of the patient. The recovery was uneventful, but several months elaped before the patient recovered from the septic anaemia.

Dr. L. M. Francis, Buffalo, (closing):—It was not the author's intention to take up the clinical side of the matter. In the discussion, the question has been brought up as to whether the ethmoid or sphenoid played the more prominent role. While we do not attempt to question the importance of the part that the ethmoid cells play, the point we are trying to bring out is this: that too frequently the sphenoid, possibly the etiological factor, is overlooked, and what we are trying to emphasize is that we must not forget the sphenoid.

A CASE OF OTITIC BRAIN ABSCESS WITH RARE OCULAR SYMPTOMS.

C. Barck, M. D.
ST. LOUIS, MO.

The patient, Mrs. V. C., was seen by me for the first time, on the 10th of January, 1910. She had been married for two years, but had no children. One brother and two sisters are living and healthy.

Previous History. Patient had a congenital, slight facial paresis on the right side. It had been noticed by her parents, soon after she was born. Since childhood, she was suffering from a chronic otorrhoea of the left ear. This was attended to at times, but in the main neglected. There was no pain in the ear, until the beginning of 1909. The pain increased by and by and became very severe in March and April of the same year. The discharge was copious and in May the mastoid region commenced to swell. On the 26th of May a mastoid operation was performed at her home in the country. But after the first week, the severe pain reappeared. It was located at that time mainly in the back of the head and neck. On account of this persistent pain, a second operation was performed two weeks later. The physican, who was present at the procedure, stated that a kind of radical operation had been done and that the ossicles had been removed. But the pain in the head continued. It was felt partly in the forehead and partly in the occipital region. Soon after the second operation, vomiting set in and during a period of three to four weeks the patient vomited after every meal. Then it gradually subsided.

One week after the second operation, the patient noticed that her vision was impaired; but no examination was made at that time. She stated that the condition was a changeable one; that at times she could see quite well, then again everything would appear dim. Since September 1909, a decided diminution in the visual acuity took place and six weeks prior to her cousultation with me, she noticed—and her family physican found on rough examination—that she had hemianopia. She was not able to see within the right half of the field of vision. Patient was still able to read on the 1st of November 1909, but not since.

Examination: No discharge from ear. Large, dry cavity. Drum-membrane and ossicles wanting; but the posterior wall in its entirety present, proving that no radical operation could have been performed. In the mastoid region a large irregular scar, somewhat depressed. No fistula; no redness around the scar. No pain on moderate pressure. Generally speaking, it was the condition we find after the healing of a mastoid operation. But there was one spot, about one inch above and one inch behind the scar, which was very painful to pressure, as well as to percussion with the style (a method recommended by me some years ago). The painful area was an irregular circle, with a diameter of about ⅔ of an inch. On repeated examinations by different observers, this painful site was invariably discovered. It corresponded to about the hinder portion of the temporal, or the foremost portion of the occipital lobe.

Spontaneous pain was not experienced within this area; but was located farther back in the occiput. There was no pronounced stiffness in the muscles of the neck, but movements of the head, especially forward or bending movements were very painful. There was no dizziness and never had been. Examination of the labyrinthine functions proved them intact.

The vision of the right eye was 1/60; that of the left 1/36; could read none of Snellen's test types. There existed complete right homonimous hemianopia. The dividing line was vertical, passing through the point of fixation. There was no palsy or paresis of the external ocular muscles. The ophthalmoscope revealed a choked disc of considerable degree in both eyes. The difference between the height of the swelling and the surrounding retina was measured as 3 diopters, corresponding to an elevation of one mm. In the left eye there were two large hemmorrhages close to the optic papilla, one of them having a diameter as large as that of the disc. No hemmorrhage in the right eye.

The paresis of the right facial nerve, mentioned in the anamnesis, was of moderate degree. It was confined to the lower branch of the nerve, controlling the muscles around the mouth and became most apparent, when the patient laughed. The upper branch, controlling the orbicularis muscle, was intact. Relatives made the statement, that this paresis had become more manifest during the last month (which statement was at that time accepted "cum grano salis").

Speech and memory were not affected. The patient spoke fluently, rather rapidly. She answered all questions in a precise manner. Her physican stated, that in June her memory had been somewaht defective; that she could not remember names correctly, but the report was too vague to be of any value. The mental state of the patient, however, was an abnormal one. It was one of labile psychical equilibrium. As a rule she was very much depressed and wept frequently. Moreover, she was very excitable, so that the examination had to be interrupted at times.

During the next few days of observation the pulse rate varied between 80 and 100 whilst the temperature was always found to be normal.

I made the diagnosis of an otitic brain abscess in the left temporal lobe; reaching far back, so as to encroach upon the optic radiation (Gratiolet's visual fibres) in the posterior part of the capsula interna. The symptoms seemed to me sufficiently clear, to assume the presence of a cerebral abscess and the only question in my mind was that of the differential diagnosis between the location in the temporal or in the occipital lobe.

Hemianopia could be the consequence of a lesion in either; in the first instance by affecting the optic radiation, in the second by destroying the cortical center. The fact that the dividing line between the preserved and the destroyed halves of the fields of division passed through the point of fixation may have been accepted in favor of the former view. For, as it is well known, according to some authorities, the dividing line, in the lesion of the cortex, passes in a curve around the center of the visual field, so that the macular region is saved and the central vision is exceedingly good, even normal. In the lesions further down, the dividing line is a vertical one impairing central vision considerably. This theory, however, is not yet generally accepted; and furthermore the presence of the enormous chocked discs complicated and obscured the clinical picture to such an extent, that I did not feel justified, to draw any conclusions from these findings of the perimeter.

My diagnosis of a localisation in the temporal lobe rested mainly on the following points: The circumscribed area, which was so decidedly painful to percussion; the want of cerebellar symptoms, as ataxia, dizziness etc.; and the absence of suppuration of the labyrinth. At first, on noticing the facial paresis of the right side, I thought, that his symptom might also be used for topic diagnosis, speaking again in favor of localization in the temporal lobe; but after learning that is was congenital, it had to be left out of consideration.

During the following days, a number of consultations were held, with an oculist, Dr. J. and a neurologist, Dr. G. The opinion of the former coincided with my view; but the latter, whilst not denying the possibility of a suppurative process, maintained the probability of a chronic encephalitis, basing his opinion mainly on the congenital paresis of the facial nerve. Yet, under the existnig circumstances he considered an operation justified.

Operation: Performed on the 14th of January. The section was made through the old scar and continued upward and backward. In the exposed mastoid there were still some small carious foci, but the bone was generally firm. The posterior wall, towards the cerebellum, consisted of perfectly healthy, dense bone. The supramastoid crest, the tegmen antri and the postero-inferior portion of the squama of the temporal bone were then removed, to expose the middle cranial fossa. The bone of these regions was enormously sclerosed and hard like ivory, requiring tedious work with the bone forceps. An area of the dura about one inch in diameter, was laid bare. The upper and hinder portion of this exposed area showed a spot of marked discoloration, which corresponded quite closely to the painful site found on percussion. After incision of the dura, the brain substance bulged out under considerable pressure. At the spot mentioned the dura was adherent to the cerebrum. The temporal lobe was then explored, partly with a long narrow knife and partly with a trocar. I introduced the instrument about twelve times in different directions, going in as far as 6 cm. Special care was taken to go backward and upward as far as permissible and I came in contact with the tentorium several times. But no pus was encountered. A drainage tube, 5 cm. long and 1 cm. in diameter was inserted and the usual dressings applied.

The subsequent course, for the first four weeks after the operation, was a very favorable one. The immediate effect of the release of the intracranial pressure was remarkable. The pain in the head dissappeared completely and the entire mentality of the patient became changed. The psychic depression had given away to a happy, at times even hilarious disposition. She was convinced that she would recover. There was no rise of temperature; sleep and appetite were excellent. The fundi were examined every few days: three days after surgical interference a considerable decrease in the size of the choked discs was noticed and they gradually became smaller during the following weeks. Within this period the vision of the left eye improved to a certain extent, so that the patient could read Snellen XII and later on XI with difficulty. The sight of the right eye did not improve materially. The hemianopia remained always the same.

On the second dressing it seemed that there was some pus in the tube; but none could be discovered subsequently. As was to be expected, a cerebral prolapse of medium size formed; this had to be clipped on two different dates, on the 24th of January and on the 9th of February.

The patient had been out of bed for some time, when a gradual change in the clinical picture took place. On the seventh of February the temperature rose to 100, and kept on rising during the following days, reaching 103-104. The headaches reappeared, becoming so severe as to necessitate the administration of anodynes. On the morning of the 14th there was loss of speech (amnesic aphasia). Then coma set in, which increased rapidly until the exitus letalis on the 18th of February.

DISCUSSION.

Dr. W. D. Black, St. Louis:—I would like to ask Dr. Barck how he accounts for the hemorrhage around the fissure of Sylvius in his case, and whether it was due to pressure.

In the majority of these specimens you will find that the ethmoid cells are closer to the orbit than the sphenoidal sinuses. In infections of the orbit from sinus disease it is more likely to be from the ethmoid than the sphenoid cells, although in many cases it is impossible to determine. In a case I had recently I was unable to determine whether the abscess of the orbit was from the ethmoid or sphenoid cells.

The case was referred by the physician in attendance owing to the great pain, expothalmos and stenosis of the nose.

Dr. C. Barck, St. Louis:—In answer to Dr. Black's question I would like to say that in any case of cerebral abscess, where there is the usual softening of the brain tissue, the arteries are always liable to be affected and may give rise to hemorrhages; but possibly one of the exciting causes was the last clipping of the cerebral prolapse. Whenever you clip such a hernia, the brain substance bulges out in consequence of which a hemorrhage may take place. On the other hand, we know that the sylvian artery is the one from which we find hemorrhages more frequent than from any other intracranial artery.

CHOKED DISK.

THE VALUE OF ITS EARLY RECOGNITION IN CASES OF BRAIN TUMOR.*

JAMES BORDLEY, JR., M. D.
BALTIMORE, MD.

The value of a symptom in the diagnosis of disease is dependent upon two things: the frequency of its occurrence and the ease and accuracy with which it is recognized.

I am confident that a careful review of the literature will bear me out in the statement that choked disk, headache, excepted, is the most common symptom in tumor of the brain. Leslie Paton in his analysis of the clinical records of 200 brain tumors found that choked disk was present in 80% of the cases. deSchweinitz found "optic neuritis" in fully 85% of the cases examined by him. The figures of Edmunds and Lawford, Martin,Bramwell, Kamphaestein and Oppenheim are but slightly less, while those of Anuske and Reich reach 95%. Through the courtesy of Dr. Cushing I have had ample opportunity of verifying the accuracy of their estimates. Indeed my own experience leads me to heartily subscribe to the statement of Gowers that "the value of optic neuritis as an indication of intra-cranial tumor is very great—in at least four-fifths of the cases of tumor, it may be the only unequivocal sign of the organic intra-cranial disease."

Sir Victor Horsley urges the importance of studying the fundus in cases of suspected tumor, not only as a means of diagnosis but for its value in determining the side on which the tumor lies. While in 70% of the patients, composing the series published by Dr. Cushing and mself, the greatest change in the optic nerve was on the side homolateral to the tumor; we stated then and I am firmly of the opinion still, that the ophthalmoscopic findings, in cases of this character, are misleading and the greater number of exceptions cast a doubt on the value of choked disk as a means of localization. In this view I find substantial support in the statements of de Schweinitz and Paton.

Nor am I prepared to believe that a choked disk, by its height, can be of assistance to the surgeon in determining either the nature of the growth or its exact position. If a tumor could, with any degree of accuracy be located and its nature determined by pathological alteration in the optic papilla it would be of inestimable value, granting, however, that this is impossible, choked disk still is of sufficient importance when we realize the truth of Gowers statement that "—it indicates progress in the morbid growth and it consequences."

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*Read by invitation.

To recognize choked disk when fully established is an easy matter, but in its early stages it often presents complex and confusing problems. We are told that, when of benign origin, hyperaemia should not be mistaken for incipient choked disk, for the latter is in reality, not simple hyperaemia, but "congestion with oedema." Associated with the hyperaemia, of chocked disk there is undoubtly oedema and if it could, with readiness, be distinguished there would be little difficulty in establishing a diagnosis. This is, however, so far from being the case that I venture to say that many cases are presented for examination in which the most skilled ophthalmologist would not risk an opinion. Nevertheless, there are certain changes, which, when found, strongly suggest the presence of oedema. Chief among them is dilatation of the very minute vessels which lie between the bundles: by the increase in their size they are thrown into stronger relief, and where the nerve fibres are most numerous the difference in color between the swollen vessels and cloudy nervous tissues results in an appearance of striping. This is particularly well seen along the superior and inferior nerve margins. While there is not infrequently striping of the edges of a normal disk, the picture is not exactly that of incipient choked disk—the chief difference lying in the vascular distension.

Next in importance in determining the presence of oedema is the actual elevation of the disk. As Growers has pointed out, the papilla derives its name from the fact that it lies in a plane anterior to that of the surface of the retina. We are, therefore, handicapped in determining the slight elevation of the primary stage of choking. Study of the physiological cup, as an aid in deciding this important fact, is invaluable. Normally the more compact the nerve fibres, the greater will be the elevation of the disk and the wider will be the physiological cup. Add, however, oedema and there is an increase in the height of the disk and a dimunition in the width of the cup. The inference to be drawn, therefore is: a slightly elevated disk with a wide cup is suggestive of nothing abnormal, while an elevated disk with a narrow cup should be looked upon with suspicion.

Again, the greater the height of a normal disk the deeper the physiological cup. In the initial stage of choked disk, co-incident with the elevation of the disk the cup becomes more shallow. This results from swelling both of the sides of the excavation and the lamina cribrosa.

Under normal conditions the nasal edge of the cup is more or less angular and the temporal edge only slightly elevated. One of the first signs of oedema is the rounding of the nasal and an increase in the height of the temporal margin of the cup.

Other changes than those in the papilla occur during the first stage of choked disk. I refer particularly to the retinal vessels. In exaggerated simple hyperaemia the arteries and veins, as a rule, appear distended and slightly tortuous. The tortuousity is shown by long curves which lie flat on the retinal surface. In contra-distinction to this in incipient choked disk, the arteries are, as a rule, of normal size and are but sligh'ly, if at all, tortuous; the veins are rather large and often show numerous abrupt curves. If the increase in intra-cranial tension is rapid the arteries frequently appear constricted, the veins markedly dilated and extremely tortuous, the curves lying on a plane at right angles to the surface of the retina. If the later stages of choked disk are slow in making their appearance, the retinal vessels may resume their normal conditions.

Associated with the venous stasis of choked disk there is frequently a dilatation of the veins of the lids. And, if the circulation in the cavernous sinus is obstructed the conjunctival vessels are likewise enlaged and the conjunctiva becomes oedematous.

The is another point which seems to be important in considering the venous changes of incipient choked disk—that is the appearance of an abnormal number of small veins both on the disk and in the retina. If one disk is swelling and the other remains normal this difference is very striking. I have counted more than twice the number in the affected than in the unaffected eye. That this is a suggestive indication, I feel sure. Indeed in our work on increased intra-cranial tension the sudden appearance of hither-to unobserved small veins was frequently the first sign noted.

Pseudo-papillitis.

Besides simple, but exaggerated hyperaemia, there is another abnormality which so closely simulates choked disk as to render its study of great importance. I speak of the so-called "pseudo papillitis" or spurious choked disk. In this fairly rare condition the disk is elevated two or more dioptres and is hyperaemic, the physiological cup is narrowed, the lamina cribrosa obscured. The most essential difference between this choked disk is the non-progressiveness of the former. The idea that chocked disk often remains unaltered for months and years holds good for the gross but not for the more minute changes.

Hyperaemia in the spurious type is usually observed on the upper and nasal portions of the disk between the margin and the physiological cup.

At times it extends down the sides of the cup and involves the lamina cribrosa, at others it appears between the vessels in the retina, just beyond the upper margin. In the cases that I have studied the disk margins were completely blurred and while there was frequently a halo surrounding the disk, it was not sufficiently profound to obscure its edges. In "pseudo papillitis" the physiological cup is narrow and deep and its angular edges cut into the central vessels so sharply that as the result of foreshortening, they disappear from view. The retinal arteries are, as a rule more tortuous than the veins and the curves of both are less abrupt than in the true form. The arteries are not buried in the surface of the disk in a manner similar to that found when the disk is elevated two or more dioptres, from oedema, nor, does an examination of the retina reveal, beyond the tortuous vessels, anything unusual. I have patients under my care in whom this picture has remained unchanged for years, and when I say that long ago I arrived at the conclusion that it was a mere congenital anomaly which varies neither in intensity nor position, I but voice the opinion of Landolt, Uhthoff, Schneideman and many other distinguished ophthalmologists.

Von Graefe in 1859, in a communication to the Societe de Biologie of Paris divided, what had hitherto been looked upon as neuritis secondary to intra-cranial disease, into "descending neuritis" and when the disk was elevated and there was vascular distension associated with retinal hemorrhage he designated it "Stauungs Papille" the former, he thought was an inflammatory extension alóng the optic nerve dependent upon a preceding meningitis, the latter resulted from obstruction in the cavernous sinus secondary to an increase in intra-cranial tension. The cavernous sinus, once blocked, he argued, stasis in the retinal veins must follow.

As a synonym for "Stauungs Papille," Clifford Albut introduced the term "choked disk."

Von Graefe's conclusions were not seriously objected to until Sesemann, in 1869, demonstrated that the premises upon which they were based were not consistent with anatomical facts. In the light of recent experience we must disregard also his ideas of the ophthalmoscopic difference between choked disk and optic neuritis of intra-cranial origin. Indeed he recognized his own mistake and brought forward cases which in a large measure disproved his conclusions.

Working in the service of Dr. Cushing, I have seen many so-called typical cases of optic neuritis gradually change into choked disk; likewise, choked disk lose all its swelling and assume the outlines of the picture drawn by von Graefe of optic neuritis. Surely the essential difference upon which he based his classification that optic neuritis is more apt to involve the retina, can no longer be regarded seriously, for we all know that at some stage, in practically every case of choked disk, the retina is the seat of oedema, of circumscribed exudates, of hemorrhages or of degeneration. As a disk begins to swell, the retina, as a rule, becomes oedematous, but as soon as the swelling in the nervehead becomes established, except for the macular fan , the retina loses its oedema, and, as the disk oedema disappears the retina again becomes clouded.

I am thoroughly convinced, from my own experience that optic nturitis is by no means as common as supposed and that many cases which have been so classified represent either an incipient or declining choking.

Notwithstanding the fact that von Graefe's conclusion can not be accepted, as a whole, to him belongs the credit for distinguishing between neuritis and choked disk and in this he is assuredly right for there is a difference which can be proven, not only ophthalmoscopically but with equal facility, microscopically. I refer, of course, to inflammation of the optic nerve dependent upon some local injury or disease ophthalmoscopically, it usually differs from choked disk in that the disk is elevated but slightly, if at all, its surface is blurred by exudative deposits, the clearness of the nervous vascular elements of the disk, so characteristic of choked disk, is wanting.

When the retina is involved—producing the so-called neuro-retinitis it is usually the seat of thin, but densely clouded exudates. The exudates are flat, their outlines are indefinite, and they are most frequently seen in the macula or just above the disk. Peri-vascular changes, which, in choked disk make their appearance late, in neuritis are found very early. So also is optic neuritis more apt to attack but one nerve, while choked disk, in the majority of instances involves both.

As has Friedenwald, so I have been impressed by the astonishingly rapid failure of vision associated with but slight visible change in the disk in true neuritis. In most of the patients seen by me the visual failure was not only rapid but, where the underlying cause was not soon removed, was complete, while the ophthaimoscopic picture was, cloudiness excepted, but that of exaggerated hyperaemia. The history of choked disk is the antithesis of this: while it not frequently remains for months it seldom causes serious visual disturbance without the choking becoming intense, or, having run its course, it declines with atrophy. To borrow a sentence from de Schweinitz "—choked disk caused by cerebral growths is perfectly compatible with good vision."

Charcot and Galezowski—the latter of whom especially investigated dyschromatopsia—regarded color reversal as a manifestation of hysteria.

Today this opinion is almost universally conceded.

In our conjoint observations of cases of brain tumor, Dr. Cushing and I were early impressed by the frequency of color disturbance in the visual fields. We were at first content to ascribe them to some associated functional element, but as the numbers increased we found that its recognition was a help in the diagnosis in intra-cranial growths. While color reversal and interlacing, undoubtedly do occur in hysteria they are as a symptom of brain tumor, quite constant, therefore their recognition is important.

We have but recently published the results of our observations still I can not, when discussing the early recognition of choked disk, dismiss the subject without, at least, briefly calling attention to such important confirmatory evidence.

The predominent feature in most of our charts is the alteration in the lines which represent blue. While both the fields for form and colors are, in some instances, concentrically contracted, almost invariably the greatest loss is in the blue field. At times this results in interlacing of the lines for red and blue, at other, the blue is found inside of red, and still less frequently it is entirely lost. The usual manner in which the change in the blue field was brought about was by the formation and fusing of peripheral scotomata. Changes in the field for colors other than blue were occasionally seen, but their inconstancy, we believe, make them of little diagnostic value. It is interesting to note that disturbance in color vision often fore-told the changes which were later to take place in the field for form. As an illustration, hemiachromatopsia in several instances preceding complete homomymous hemianopsia.

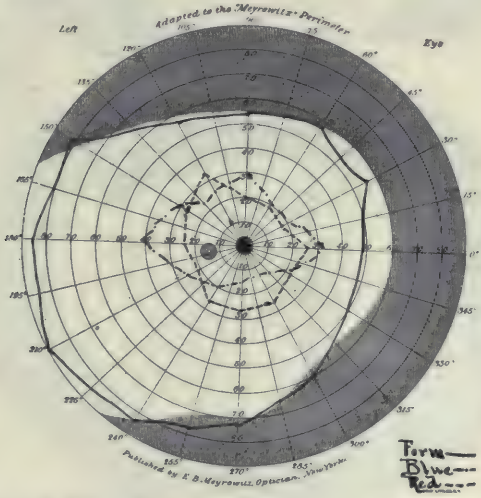

Adapted to the Meyrowitz Perimeter
Left
Eye
Published by E. B. Meyrowitz, Optician. New York
Form
Blue
Red

Fig. 1.—To illustrate color interlacing. A case of cerebello-pontine tumor. Choked disk 1½ D.

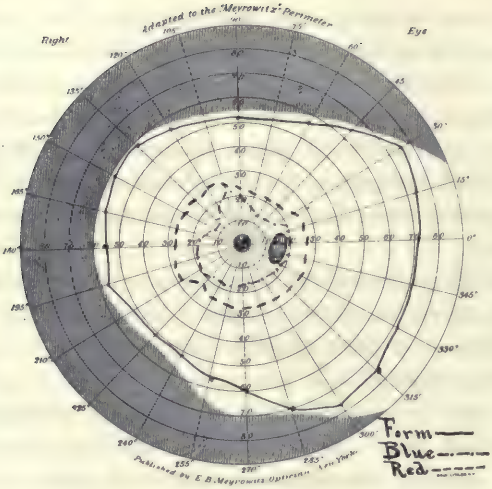


Fig. 2.

To illustrate color inversion. Case of glioma of left frontal lobe.
Choked disk 6 D.

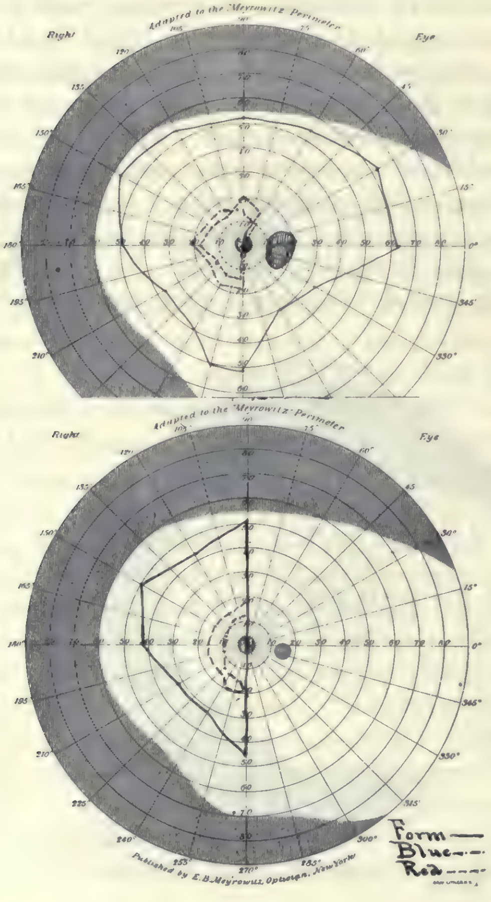


Fig. 3.

To illustrate the progress of hemianopsia.

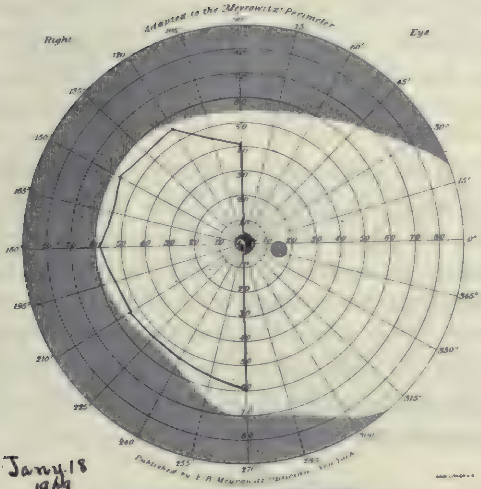
Chart 1. Color interlacing in one-half of the field, achromatopsia in the opposite.

Chart 2. Fourteen days later. In place of color interlacing there is color inversion.
Complete hemianopsia has succeeded hemiachromatopsia. A case of glioma in left parietal region.

Choked disk 4 D.

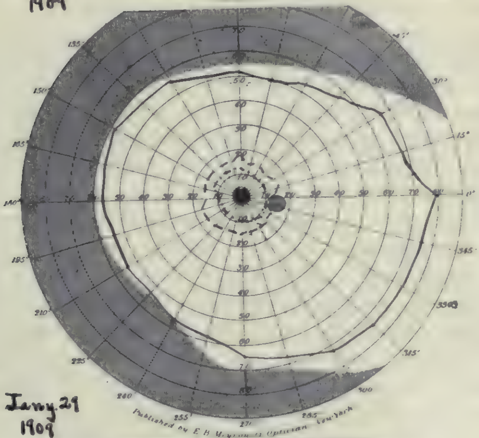
Fig. 4.

To illustrate the changes in the color fields subsequent to sub-temporal decompression.


Adapted to the Meyrowitz Perimeter
Right
Eye
Published by E. B. Meyrowitz Optician New York

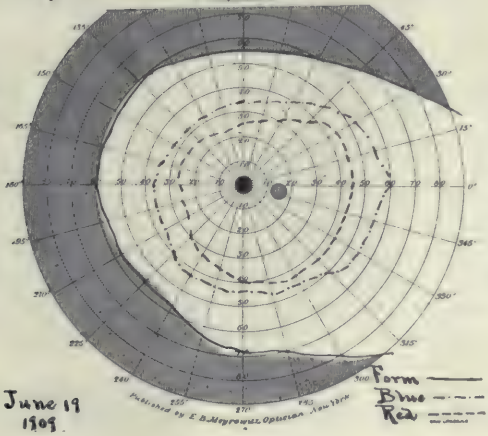
Jany 18
1909

Chart 1. Immediately before operation. Hemianopsia and complete achromatopsia.



Jany 29
1909

Chart 2. Nine days after operation. Form field practically normal, color inversion.



Form ——
Blue -·-·-
Red - - - -

June 19
1909

Chart 3. Complete restoration of fields for form and colors. A supposed case of tuberculoma of the left occipital lobe. Headache, vomiting, choked disk 1½ D.

The color disturbances do not seen to be dependent upon the presence of neuro-retinal oedema, because in several of our patients they anti-dated ophthalmoscopic changes. Following decompressive operations these changes disappeared and we concluded that their presence must, in some way, have been dependent upon increased intra-cranial tension.

The foundation for the diagnosis of incipent choked disk lies mainly in our ability to recognize the alterations in disk and field to which I have so briefly referred. I would not have it inferred, from what I have said, that this is an easy task, for well do I know that many cases present complications, the significance of which can be determined only by patient study. Nor would I advise an ophthalmologist, in the study of choked disk, to limit himself to his own observations. If I did, I would be unmindful of the valuable assistance rendered me by my friends—the surgeon and neurologist.

DISCUSSION.

Dr. Barck:—It is not yet half a century since the partial decussation of the optic nerve fibers in the chiasm was uniformly accepted by the profession. Before that time, many were in favor of a total decussation of the fibers, as is the case throughout the entire animal kingdom. Such an eminent authority as Dr. Koelliker, was a strong advocate of the latter view and the scientific controversy lasted for a number of decades, until it was finally settled in the seventies, in favor of partial decussation. It was mainly Gudden and Michel, who established the fact of partial decussation beyond all doubt, by demonstrating that the ascending atrophy after enucleation passed through the chiasm into each optic tract. This brought about the long desired harmony between anatomy and the clinical facts of ophthalmology, which were inexplainable upon the theory of total decussation. During the following period, the doctrine of the different hemianopsias was expounded in quick succession by Mauthner, Henschen and others.

Until a few years ago, we could differentiate only between affections of the nerve, of the chiasm and of the entire visual path beyond the chiasm. The different portions of this pathway—optic tract, primary center, optic radiation and cortical center, could not be distinguished clinically. It is true, that Wilbrand and later Wernicke tried to differentiate upon the basis of the "hemianopic pupillary reaction," maintaining that the absence of the reaction from the blind halves of the retina indicated an affection beyond the primary center, and true, that subsequently Wilbrand attempted to use the reflex-movements of the line of vision for the same purpose. But the results of the examinations of these phenomena were not uniform enough to be accepted.

Recently Behr and then Lenz (1909) used the configuration of the visual field for differential diagnosis. It was known that the dividing line between the blind and the preserved halves of the field was in some instances a vertical one, passing through the very center and impairing the central vision materially; whilst in other instances, the dividing line passed in a curve around the center of the field, so that the macular region was spared and the central vision very good, often normal. The mentioned authors, from the careful synopsis of a number of closely observed cases with post mortem examination came to the conclusion, that "the sparing of the macular region" indicated a lesion beyond the primary center.

The opinion as to the real location of the primary visual center has changed during my life time. It was of course always located in one of the large ganglia, but first in the optic thalamus, later in the corpora quadrigemina and finally in the lateral geniculate bodies. It is now claimed by the microscopist, (most of these investigations we owe to Bernheimer) that the fibres of the optic nerve can be traced directly into the large ganglion cells in these geniculate bodies. From there the path goes by way of the optic radiation through the capsula interna and finally reaches the ultimate center in the occipital lobe.

If the assertion of the men quoted, that the vertical dividing line of the field is indicative of an affection of the optic tract, and the sparing of the macula, of a lesion beyond the geniculate bodies, it would be of enormous value for topic diagnosis in the most different intra-cranial lesions. But the conclusions of Behr and Lenz were afterwards disputed. It was stated that not all of the cases reported by them could be taken for full value, because in a number of them the clinical picture was obscured or altered by the presence of choked disc. Just lately, however, another instance has been reported, which again spoke in favor of their theory; it was a case of uncomplicated hemianopsia, where the dividing line was verticle, the central vision very poor, and where, at post mortem, a destruction of the optic tract by a tumor was found. These contradictory reports induced me to go over my own records, but after excluding all cases complicated by choked disc and all cases in which the clinical picture was not complemented by operation or autopsy, I could find two, which I will state briefly. One was seen in the year 1890, and it was a gentleman who was affected very suddenly by a right-sided hemianopsia the central vision was exceedingly good, and remained so during the following years of his life, so that he was able to read fine print up to the end, which took place about three years afterwards. The post mortem confirmed the diagnosis of hemorrhage and consequently softening at and around the calcarine fissure of the left side. The other instance was a case where the macula was not spared, where the central vision was exceedingly poor; (I must confess, that at that time I was not aware of the importance of this symptom). It was also a case of right-sided hemianopsia and the autopsy revealed a tumor, which had destroyed more or less the optic thalamus, the geniculate bodies and a portion of the optic tract.

Now the charts, which Dr. Cushing has passed around, seem to me to speak also in favor of the new theory. Unhappily, I could not examine all of them, as not all were passed around on our side: but I have seen most of them. What struck me as being very important is , that in all cases of crossed hemianopsia, bi-nasal or bitemporal, the central vision was considerably impaired. In these cases the lesion was of course one of the chiasm. I shall certainly study Dr. Cushing's article very carefully after its appearance in print; for I believe that his material is larger and more carefully studied than that of anybody else; and our society is certainly very much indebted to him for his excellent contribution.

It will be very important to establish beyond doubt this differentiation between lesions peripherally to the primary center and lesions beyond it. Only if we can rely upon it as an absolute fact, will the conclusions drawn from it as to the location of a lesion, be of value But in order to decide this question, a larger number of carefully examined cases is necessary. And, these cases must not be instances of choked disc.

Dr. Wendell Reber, Philadelphia:—Personally I feel very much repaid for my journey to Cincinnati for the privelage of listening to these two papers. I was struck with one observation made by Dr. Cushing, namely, that one observer had furnished him with transposed fields. I have seen this very thing occur. I think it is due to faults in our present day perimetry. If a blackboard or umbrella perimeter is used no such mistake could occur.

My own feeling is that such fields should be taken with the smallest possible object. In our own work we have used nothing but a 5 mm. object where possible, going on, if necessary, to a 10 mm. object; but all such fields should be taken on a black surface, in which case the defect is perfectly apparent and there can be no mistake; whereas, if it is done with the ordinary arc instrument there is danger of mental confusion on the part of the patient. To obviate that, and in order to get arc projections, which has never been done in the ordinary arc instrument, we have lately devised an umbrella like instrument, (my assistant, Dr. McCoal and myself) which ought to prove vaulable.

It is interesting to hear that lesions in the temporal lobe will so often produce hemianopsia. I have never seen such a great array of them as we have been treated to to-day, and none to my recollection has been brought forward in the literature. Another thing is the fact that brain tumors and hysterias may travel so closely together that the best men may be deceived. I know of four very prominent men who thought a certain woman had hysteria, and she finally developed a brain tumor. I have had two cases of quadrant hemianopsia. One of them is now under the sod. I tried to buy the body and failed. The other has been living for ten years at least, and has gone from ophthalmologist to ophthalmologist in Philadelphia. And, at present I have under observation the wife of one of our prominent physicians in Philadelphia; there is a mere suggestion that the right blue field is trying to invade the red field. There is only slight constriction of the color fields on the left side, slight lowering of corneal sensibilty, and doubtful evidence of involvement of the 3rd. 5th. and 6th. nerves, but rather tangible evidence that they might be involved. A tentative diagnosis of brain tumor has been made, but there is no choked disc, nor hyperemia. I have the records and know what that fundus is and has been 6 or 8 years past, and I can safely say there is no hyperemia of the nerve head in this case. But of one thing we should be wary, and that is hurrying into a diagnosis of either brain tumor or hysteria on the ocular findings alone.

Dr. A. R. Reeve, Toronto:—The last remark of our worthy president warrents my calling attention to another symptom other than the field of vision or the presence of optic neuritis. This statement was made by Mr. Buzzard, of the Queensware Hospital for the Paralyzed and Paralytic in London, and the statement was characterized by Horsley, who is the well-known British neurologist, and it was to this effect that the so-called Argyl-Robertson pupil in the absence of optic atrophy indicated grave disease in or near the third ventricle. He laid that down; he considered that he was warranted by the cases he had had and the pathological observations made in making that statement.

Dr. W. R. Parker, Detroit:—I would like to ask Dr. Cushing if, in his observations as to the eye first involved in choked disc, consideration has been taken of the tension of the eyeball? Whether it occurs more often on the side of the tumor or on the opposite side must be a question of a very small percentage of cases, the observations of equally competent men varying but slightly in their results. With our new instruments of precision we now know that eyes which give a normal tension as taken by the fingers, may vary considerably when taken with the tenometre. It has seemed to me that this difference in tension might lead to difference in resistance, the nerve in the eye showing the lower tension being the first to show oedema.

Dr. Harvey Cushing, Baltimore (closing)—I am exceedingly grateful for this discussion of Dr. Barck's for he has raised an issue which I had hoped would be brought out. I particularly desired abundant criticism on the part of ophthamologists of our views concerning the production of binasal hemianopsia.

Our cases may be summarized as follows: (1) In every certified temporal lobe tumor (5) cases the macula is not included in the hemianopic field. (2) In three of the four suspected temporal lobe tumors the macula is not included in the hemianopic field. (3) In two occipital lobe lesion the macular field is not included in one, cut through its center in the other. (4) In all the anterior lesions, pituitary tumors, internal hydrocephalus (6 cases) the hemianopic line passes through the macular region. (5) The remaining cases are indefinite.

Of course this is all in favor of Lenz's view, which I should like to have taken up further in the pages of my paper. However, these anterior lesions, including the bi-nasal as well as the bi-temporal, are in all probability due to disturbances in the neighborhood of the chiasm. When there is relief from pressure the central vision usually returns.

Dr. Parker's question is an interesting one. I think it is generally supposed that the most marked choked disc occurs homo-lateral with the lesion itself. It is not conclusive in tumor that the condition is most marked on the same side. There are a great many factors that come into play as he suggests. You may, of course, have some anatomical condition that prevents the fluid from coming down into the nerve sheath, and if that condition is present on the side of the lesion, the fluid would come down and distend the nerve head on the contra-lateral side. Horsley brought out an interesting point in regard to the position of the edema in each eye, namely, that on the nasal side, as we all have known for a long time. the edema occurs first, that is, the side in which the ampulliform dilation is most apparent, grossly speaking. But the suggestion that the eye which is most "lax" is the eye in which edema first occurs, I hardly feel like accepting, in view of the prevailing theory in regard to the mechanism of choked disc; namely that it is due to a fluid pressure and whether the fluid comes along the vessel's of the nerve or finds its way along Schwalbe's sheath makes little difference.

Oto-Laryngologic Section.

ERYSIPELAS AS A COMPLICATION OF MASTOID DISEASE.

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Erysipelatous complication in surgical operations has always been a source of greater anxiety and embarrassment to the surgeon and attendants than any complication that occurs. My own observations, verified in eleven cases occurring in my practice in the last twenty years, agrees with those given by George Richards at the meeting of the American Otological Society in 1910, which confirms in a large measure the observations of C. R. Holmes, C. F. Welty and others. These conclusions are:

1. The occurrence of a case of facial erysipelas in a hospital ward is not, of necessity, any reflection on the surgeon or the hospital, as it arises in nearly every primary case as a result of auto-infection.

2. Erysipelas is probably much less contagious by direct contact than has been supposed, and should, therefore, be less feared; nor is there much likelihood of an endemic of erysipelas occuring from a single case of erysipelas, provided the infection is not transmitted by the attendants, instruments, dishes, etc.

3. As a routine measure in all operations on the mucous membrane of the upper air tract, it would be advisable before operating and for several days afterwards to cleanse the nose as carefully as possible; though it is by no means asserted that in this way every streptococcus or pneumococcus germ can be destroyed.

The eleven cases treated by me confirm the correctness of this conclusion. In the discussion of this subject at the last meeting of the American Otological Society, Wendell Phillips called attention to the fact that "cases of post-operative erysipelas which were formerly removed from the Manhattan Eye, Ear, Nose and Throat Hospital, are now taken care of in this hospital." Alexander Randal says, "There may be some local immunity, so there is less danger of carrying the germs of erysipelas to the neighboring tissues than to some more distant field, and while the care and the isolation of the patient is important, care on the part of the surgeon and especially the nurses to prevent spreading the infection is more important."

My experience is in accord with George Leland's, who says that "Erysipelas may affect a patient in one bed and not a patient in the near vicinity," and he had never seen any real practical reason for isolating these cases in a separate building. He also cited a case "in which the mastoid operation had been performed in a case of erysipelas, and healing took place as promptly and as completely as it would have done through the normal skin, and the erysipelas remained external." I do not recall an instance of infection by direct contact of one patient with another. A most remarkable and inexplicable fact is the morphology of the streptococcus of erysipelas, the germ sometimes seeming to be inactive in one locality and active when transferred to another, and while undoubtedly direct contagion (infection) may and does occur, erysipelas is not so contagious as was previously supposed.

Case I.—In October, 1900, Mrs. W., aged forty-six, developed erysipelas on the third day following a classical mastoid operation. This case had suppurative ethmoiditis, and there was a discharge of muco-pus almost constantly from the nose. Temperature ranged from 101° to 105°.

Case II.—In October, 1902, Miss R., aged nineteen, developed erysipelas on the third day after a classical mastoid operation and a radical operation on the maxillary antrum.

Case III.—In April, 1903, Mrs. B., aged thirty-three, developed erysipelas on the second day after secondary mastoid operation and removal of a large polypoid middle turbinate.

Case IV.—Mrs. H. aged twenty-nine, had double mastoid radical operation, February 2, 1908. She had had constant suppuration from both ears since infancy; had chronic ethmoiditis, and at the time of operation was very septic and had marked evidences of meningeal irritation. The middle turbinates had been removed a year or two before, but there was still a slight discharge of pus from the frontal sinus. On the fourth day after mastoid operation, erysipelas developed on the right side. Seven days afterwards the opposite side was involved.

Case V.—Miss A., aged thirty-eight, operated for double mastoiditis of staphylococcus and influenza infection, February 29, 1908.

The simple mastoid operation was performed. Convalescence was uninterrupted for ten days, when mild erysipelas started on the right side at the lower edge of the mastoid wound, extending in four days to the opposite side. Infection in this case was supposed to be due to a severe influenza from which she suffered several days before the erysipelas developed.

Case VI.—March 11, 1908, Mr. B., aged fifty-one developed erysipelas on the seventh day after extensive radical mastoid operation superiosteal abscess. He had at the same time suppurative degeneration of the ethmoid cells and a large polypoid turbinate. This was not removed at the time of the mastoid operation.

Case VII.—Mr. R., aged twenty-nine, had radical mastoid performed on March 18, 1908. There was bony occlusion of the auditory canal. The middle ear cavity was full of polypoid granulations with an erosion in the tegmen tympani on account of the almost complete bony occlusion of the auditory canal and the destruction of the membranous canal; it was with difficulty that satisfactory flap was obtained. Case ran normal course for four days when there was a sudden rise of temperature, and erysipelas developed on the right cheek and gradually extended until the whole of the face and scalp was involved.

Case VIII.—March 31, 1908, Mr. E., aged thirty-two, developed erysipelas ten days after radical mastoid operation.

Case IX.—January 9, 1909, Mrs. H., aged forty, had had chronic suppurative ethmoiditis and frontal sinusitis for several years. Four years previously the middle turbinate had been removed and drainage established in the frontal sinus. The anterior ethmoid cells which had undergone polypoid degeneration, were thoroughly curetted. On the 9th of January, 1909, had acute attack of fulminating suppuration of the frontal sinus, in which the pus burst through the ethmoid cells at the inner canthus and through the cortex of the thin outer wall of the right frontal sinus. The Killian operation was performed and all went well until the thirteenth day, when she had an acute inflammation of the middle ear on the right side. A myringotomy was done and the smear showed pure culture streptococcus and influenza infection, the same as was found in the frontal sinus. In twelve hours a fulminating mastoiditis had developed. Operation revealed a violent and rapid destruction of the entire cellular structure. Three days after the mastoid operation there was a violent attack of acute erysipelas of the face, eyes, forehead and scalp.

Case X.—Mrs. B., had a radical mastoid operation performed on March 1, 1909, for chronic middle ear suppuration, which had existed since childhood. She had a large polypoid middle turbinate on the right side, but there was no evidence of active suppuration. A thin, muco-purulent discharge could be seen covering the posterior end of the middle turbinate. Case ran the usual course, uninterrupted recovery until the eighth day, when erysipelas developed at the lower edge of the mastoid wound.

Case XI.—On June 4, 1910, Mr. S., aged thirty-three, had suppurative accessory sinus trouble for several weeks. Part of the inferior turbinate had been removed by Dr. K., ten days previous to my seeing him. This was followed by secondary hemorrhage twenty-four hours after operation. Two days later acute middle ear infection and suppuration developed. Free myringotomy of both sides gave no relief. Symptoms of meningitis rapidly developed, and I was called to see him the tenth day after the removal of the turbinate. The smear from both ears showed pure streptococcic infection as well as the discharge from the nose, which was very profuse. There was both a high leucocyte count and greatly increased percentage of polynuclear cells. I found upon examination that both mastoids were involved and a double classical operation was performed which revealed most extensive destruction of bone and exposure of the sinuses, with a large fissure in the tegmen tympani on the right side. Case did well until two days later, when erysipelas developed on both sides. The leucocyte count increased 14,800 and polynuclear to 91 per cent. The progress of the case was slow and uneventful. Recovery perfect.

Cases IV, V, VI, VII, and VIII, coming so closely together, look suspiciously like transmitted infection, but, as far as I was able to ascertain, the technique on the part of my assistant who did the dressings, and on the part of the hospital and nurses was faultless. There had been no other cases, nor were there any in either hospital at the time these developed. In these cases, as is my custom in all mastoid surgery, the same care and technique is used in the first four or five dressings as is used in the operating room at the time of the operation.

Analysis of the cases referred to shows that nine were developed in the hospital in from two to eight days after operation; five were ward cases; four private cases in private rooms; two developed after leaving the hospital. There was no apparent delay in the healing process in any of the cases. I am unable to explain why out of more that 500 operations upon the mastoid I should have had these complications when there were none such in other operations such as those upon the frontal sinus and other operations upon the nose and throat. All of these were typical cases, running the usual course with very high temperature, from 100° to 105.5°, with great prostration, occasionally a delirium, and terminating in eight to twelve days; all of these cases made complete and satisfactory recovery.

The treatment used was supportive in the way of nourishment and stimulants as indicated. In seven cases pure carbolic acid, followed by alcohol. This treatment was alternated by applications of ichthyol. In four cases equal parts of carbolic acid, camphor and olive oil was applied locally every four to six hours, and the parts protected by wet dressings of gauze saturated with normal saline solution or saturated solution of magnesium sulphate.

Restlessness and sleeplessness were relieved by a dose of three or five grains of veronal, asperin and phenacetin. If this failed to give relief an opiate was given subcutaneously. Nine of the cases had disease of the nasal accessory cavities, and it seems that this fact would justify the probability of the etiology of the disease as being due to auto-infection.

In no instance was there any spread of the disease to other patients, though the cases were nearly equally divided between two different hospitals, and the five cases in the hospital wards did as well as those in the private rooms or at the home of the patient.

The conclusions arrived at from the study of the cases reported are:

1. The disease appears to be due to an auto-infection, probably from the nasal or nasal accessory cavities.

2.. It is not as contagious or infectious as it is supposed to be, being transmitted by contact.

3. The disease appears to be self-limited, with a duration of eight to twelve days, and in two of the cases reported, where the anti-streptococcus serum was used, the results were no better than in cases in which it was not used.

4. The treatment which gave the best result was the local applicaution of equal parts of carbolic acid, camphor and olive oil, with carefully regulated nourishment and judicious use of stimulants and anodynes.

5. Isolation in separate room or pavilion is not necessary, but extreme care on the part of the surgeon and attendants is imperative.

DISCUSSION.

Dr. J. C. Beck, Chicago:—For the wealth of material that has been accumulated by Dr. Stucky on this most important complication in our line of work, we are certainly indebted to him for the frank statement concerning this condition. I will confess that I have not had such a large amount of complication as he has had. I have noticed in mastoid work where we formerly used iodoform dressing, there arose a condition similar to erysipelas, and he should have stated something concerning the differential diagnosis in these two cases. We all recognize the irritation from iodoform dressing. Since discontinuing the use of iodoform I have not had any of the so called erysipelas secondary to the mastoid operation. In the past year I have had three cases of erysipelas following mastoid in the Cook County Hospital, where it is absolutely necessary to isolate the cases, and these cases we transferred to the infectious wards, and there they mixed with other infections not erysipelas. In one of our cases there was secondary infection of the streptococcus type, and immediately after the second infection with erysipelas the primary infection disappeared. These cases showed much more rapid healing than in the uninfected cases.

With reference to the former use of iodoform and now the use of iodine preliminary to the operation; in the last two years in my private practice I have used iodine as a local application over skin preliminary to operation and I believe in these cases the infection is less after the wound has been made. I have found no better treatment than ichthyol with colodian dressing, which prevents the infection from spreading somewhat when erysipelas once develops.

Dr. O. J. Stein, Chicago:—It seems particularly interesting to me, and more than passing strange, that he should have so many complications of this character following this particular operation, while many of us, myself included, have never seen this complication following the radical mastoid.

There must be some reason why in his experience he has had such a large number of such cases. He explains it on the ground of auto-infection. It is interesting to know if he could follow out the principal of the auto-infection, assuming that it must come either through continuity of tissue within the head, as for instance along the Eustachian tube, or from the skin side without, or by way of blood or lymphatic currents. It seems to me the value of this paper of Dr. Stucky's would have been enhanced if we could have had greater detail as to the way he handles his cases. I cannot help but feel that the key to the situation lies there. It cannot be the patient. They certainly do not differ from those in Illinois and Pennsylvania and other states. It is certainly not the operator, and it must be something at the time of the operation or immediately following the operation. When does he remove his first dressing? What does he do at the time of his second dressing? How does he sew his wound? What does he use in dressing his wound? As intimated by Dr. Beck, the iodoform brings a flush and a resemblance to erysipelas. There are a great many points that have bearing on this question which I regret that he has not gone into.

Dr. G. F. Keiper, Lafayette, Ind.:—One of our distinguished local confreres, Dr. C. R. Holmes, recently went into the subject of erysipelas, and according to his idea, he places the origin within the nose, and agrees with Dr. Stucky. It has been my misfortune to have had one case following a double mastoid operation. Where it came from I do not know, but from some cause or other we had a severe inflammation following the operation in six days. There is no fun in handling a case of that kind, by any manner of means. I am convinced that it is a contagious disease, that is gotten by contact. This man was adicted to strong alcoholics and his opsonic index was low. I would suggest to Dr. Stucky that he examine the hospital, because I am satisfied that the trouble was in the hospital. I have a suspicion that the large number of cases of erysipelas are infectious and that the disease may be prevented. I would like to ask the doctor if the other surgeons to the hospital—the general surgeons, are subjected to like difficulties.

Dr. Stucky:—Not at all.

Dr. J. S. Kirkendall, Ithica, N. Y.:—I have been interested in the paper. In at least one hundred and fifty cases of mastoiditis which I have operated upon within the past ten years I have never had a postoperative case of erysipelas as pictured by Dr. Stucky. I am Ophthalmologist at the State Hospital at which institution was admitted an old lady 64 years of age who had an inflammation of both external auditory canals, both taken simultaneous with a discharge from the external canals which was examined and found to be streptococcuc infection and simulated, from the edema and general conditions, mastoiditis and was so diagnosed by eight or ten well equipped men of the institution. I was called and upon examination of the drum membrane could not feel that the mastoid cells were invaded but since there were some symptoms which might be considered as a primary otitis as given by the physicians present and the extreme edema of the post auricular tissues as well as the external canal and surrounding tissue, I felt that an exploratory incision was justifiable. While I gave my opinion prior to the opening of the cells that the cells were not invaded so I was not surprised upon opening the mastoid to find the cells perfectly normal. This is schooling for an operator who has never seen a living normal mastoid cell. The patient was prepared for a double mastoid operation. I immediately had the part thoroughly painted with pure carbolic acid leaving it for a few minutes after which it was thoroughly neutralized with alcohol. The patient was put to bed and made a quick recovery from erysipelas. While the opening of the cells was a mistake on my part in a way, I do not believe I am the only one who ever made an exploratory incision in mastoid cases. Would say that it was impossible with her mental condition to get a picture of her previous history.

Dr. S. J. Kopetzky, New York:—I have very little to add to what Dr. Stucky has presented, but a few observations from my own experience with this infection may be of value. I have had erysipelas infection following mastoid surgery,—some of my cases have died because of meningeal infection which followed.

Regarding the question of isolation after the patient has been attacked, I agree with the speaker. I have not isolated all my erysipelatous infections following mastoid operation, and as far as I know I have not been the means of carrying the infection to other cases upon which I operated about the same time. In trying to trace the origin of the infection in some of my cases it was interesting to find in one case that the patient had been working in an office where there was another individual suffering from erysipelas. Another case occurred in a child in the family of which there was scarlet fever, and this set in line a thought, which upon investigation showed that when scarlet fever was prevalent in New York, at least, most of the cases of erysipelas are found to develop. I can not show any connection between the two conditions; it is simply an observation, and I present it for what it is worth. In my cases I could not find a distinct connection between the nasal infection and the erysipelas infection of the mastoid wound. I found the inflammation starting immediately around the wound. Had it started at the nose the first flush should have appeared on the face around the nostrils. In the majority of my cases of erysipelas the operative findings evidenced the presence of a good deal of pus and the field of operation was hemorrhagic. If one remembers the fact that the blood vessels are open and the edges of the wound are in contact with the pus it is conceivably easy for an inoculation of the skin to be set up and the lymphangitis characteristic of erysipelas to develop from the bacteria in the depth of the wound. On the question as to whether or not it delays healing, I have no comment—I do not know.

Finally I would recommend the saturated solution of magnesium sulphate applied hot to the wound as a means of relief, I have found it to relieve tension and pain.

Dr. Byington, Battle Creek, Mich.:—I have had one case of erysipelas following mastoid operation, which I believe was a case of auto infection. It was the first case operated upon in a new hospital. Bacteriological examination of the pus found in the antrum showed that it was a streptococcus infection. The erysipelatous inflammation first appeared the third day after the operation adjacent to the lower angle of the mastoid wound, from which it extended over both sides of the head and down the back of the neck.

Dr. D. T. Vail, Cincinnati, O.:—It has been said by the author of the paper and others that erysipelas of the mastoid is secondary to auto-infection, and some very good cases have been reported to prove this theory. It has also been said that the infection exists in the nose in the shape of an empyema of the cells. I have no doubt that the infection in the nose is the infection that sets up the erysipelas in the patient's mastoid, but the question that concerns me most is **whose** nose? It is not always the patient's nose and I believe never the patient's nose. I was very much entertained by a surgeon telling me recently of the many cases of erysipelas that followed him wherever he operated, and he asked me to enlighten him as to why this trouble pursued him in this peculiar way. Later on I learned that he had been a sufferer from chronic empyema of the accessory sinuses of his own nose on one side. It occurred to me that he was probably the "Typhoid Mary" in the case. If it is not yourself, how about your assistants and those who help in the dressings and subsequent treatment of the case? I think this is the key to the situation. Dr. Stucky should examine the nose of everybody connected with him in his hospital work, and he may be rewarded by finding the guilty party.

Dr. J. A. Stucky, (closing):—I belong to societies of this kind in order to report my short-comings and get help. I am glad all of you have been successful. I have asked a dozen or more of the most prominent otologists of this country and they said they have had cases similar to ones I reported, but did not report them. In regard to Dr. Beck's inquiry would say that 95 per cent of the operations referred to, on the mastoid ought to have been done weeks or months before. The patients were absolutely soaked with septic poison; the vitality always below par as demonstrated by the blood count.

There is a difference between the erythema of iodoform and that peculiar redness of erysipelas. With the former we do not have the high temperature, and the delerium and the great prostration.

As to the method of infection I do not know.

I believe I have had in the past few years one of the most competent assistants any man could have, and referring to Dr. Stein's theory of the technique, I am regarded "an old maid" as to technique. The first four dressings are removed under the same precautions as the operation is done in the operating room.

Referring to Dr. Keiper, there is absolutely no reflection on the hospitals. The other surgeons have not had this complication.

Dr. Kopetsky's point is well taken. They all bleed very easily. I have tried the saturated solution of sulphate of magnesia, but it did not seem better than the normal salt solution.

SOME LANTERN SLIDES ILLUSTRATING THE COMPARATIVE ANATOMY OF THE NOSE.

J. M. INGERSOLL, A. M., M. D.
CLEVELAND, O.

In studying the developement of any of the organs of the body two factors must be considered, the capability of variation and heredity. Heredity is a conservative factor and tends to retain the ancestral characteristics. The capability of variation is influenced by the external conditions in which the animal lives and it tends to modify various organs and adapt them to new conditions. The resulting modifications are transmitted to future generations, but there is a constant tendency for the changed organs to revert to their primitive form.

If we examine the olfactory organs of various animals and compare them with each other, we may see some of the results of these two parallel factors, and learn how the olfactory organs have attained their present form in man.

The olfactory organs of fishes are rather simple depressions on each side of the snout which do not communicate with the mouth. Each external nostril is divided by a fold of skin into two openings thus forming the anterior and posterior nostrils.

In the white fish the median wall (septum) supports a rounded prominence from which numerous lamellæ radiate. These lamellæ increase the expanse of the mucous membrane which is covered with olfactory epithelium.

The character of the nasal organs is modified in reptiles, by the change in the method of respiration. The nasal fossae open into the mouth and are differentiated into an olfactory and respiratory portion.

The olfactory organ of the turtle consists of two symmetrical cavities with a relatively thick partition in the median line. Each cavity is subdivided into a respiratory and olfactory region. The respiratory part is a tube-like structure which extends downward and backward and opens into the anterior part of the mouth, thus forming the posterior nares. Around these two openings into the mouth there are numerous finger-like projections which, when they are brought into apposition partially close off the posterior nares from the mouth.

The olfactory part of each fossa is a round cavity, above the respiratory region, and partially separated from it by a prominence projecting out from the lateral wall. This prominence corresponds to the turbinal in other vertebrates.

In more highly developed reptiles the secondary palate is formed by the union of the palatine processes of the superior maxillary bones with the pterygopalatine arch. Thus a secondary roof of the mouth is formed distinct from the sphenoidal or primary roof. The cavity thus formed below the sphenoidal bone, prolongs the nasal chambers backward so that they open into the nasopharynx, instead of the mouth.

In most birds the anterior portions of the nasal fossae communicate with each other, the septum being incomplete, and posteriorly the two fossae have a common opening into the pharynx, which is surrounded by finger-like projections similar to those around the posterior nares of the turtle.

In the duck there are three turbinals in each fossae. The anterior one is an inverted T, attached to the roof of the nasal chamber and is suggestive of the turbinal with a double coil seen in the higher forms of vertrebrates. It is, however, covered with stratified epithelium, and is called a pseudo turbinal.

There are two ethmoidal turbinals. The anterior inferior one has a double coil and occupies the greater portion of the olfactory part of the nose. The superior ethmoidal turbinal is a simple prominence with two irregular projections extending downward.

The bear's nose is a very highly developed organ of respiration, and olfaction. The anterior half of each nasal fossa is used almost exclusively for respiration, the posterior half is subdivided into two superimposed cavities by the union of the lateral wings of the vomer with the ethmoidal bones. The superior cavity is the larger one and contains nearly all of the ethmoidal turbinals and forms the greater part of the posterior portion of the nose. The inferior cavity is a tube-like structure which connects the respiratory portion of the nose with the nasopharynx.

The maxillary turbinal has a broad base which supports numerous branching processes almost completely filling the respiratory part of the nose.

The ethmoidal turbinals are exceedingly complex structures, five in each fossa, which radiate from the convex surface of the cribriform plate. Their almost innumerable branches are covered with olfactory mucous membrane.

The maxillary, ethmoidal and frontal sinuses are all well developed and contain some branches of the ethmoidal turbinals and thus form a part of the olfactory region of the nose.

In the seal, the maxillary turbinal is a wonderfully highly developed structure. Its numerous, intricate, fine branches nearly fill the anterior half of each nasal fossa.

There are five ethmoidal turbinals which spring from the cribriform plate and extend forward toward the maxillary turbinal. The superior ethmoidal turbinal has several branches which are supported laterally by attachments to the perpendicular plate of the ethmoid bone. This support of part of the ethmoidal turbinals by the nasal septum is characteristic of miscromatic animals. The frontal sinus is small and contains a branch of the superior ethmoidal turbinal. There are no maxillary, ethmoidal or sphenoidal sinuses.

The relative position of the turbinals is changed in apes and in man. The developement of the fore-brain, especially in man, pushes the ethmoidal and frontal bones forward and the nose appears to recede into the head.

The turbinals in apes are comparatively simple structures. The maxillary turbinal in some apes has a double coil, but the superior coil is small and shows the tendency toward degeneration of this part of the turbinal. In the orang-outang and chimpanzee the superior coil has entirely disappeared. The ethmoidal turbinals vary in number from two to five in different species, and are all simple structures.

The maxillary sinus is usually comparatively large and opens into the middle meatus through a small ostium. The ethmoidal cells show great variations; in some species there are none, in others only a few cells and in still others there are numerous cells. The sphenoidal sinuses vary almost as much as the ethmoidal cells do. The chimpanzee is, I think, the only ape in which the frontal sinus persists.

In man the turbinals are, for the most part, more degenerated than they are in apes. During foetal life they show more of their primitive characteristics. The septum is relatively thick. Four or even five ethmoidal turbinals may be present and the agger nasi, which is the rudiment of the nasal turbinals in lower vertibrates, is usually well developed, but as the foetus matures these rudimentary characteristics disappear.

The respiratory function of the nose becomes more important than the olfactory function in man, and the nose ceases to be as important a special sense organ, as it was primarily.

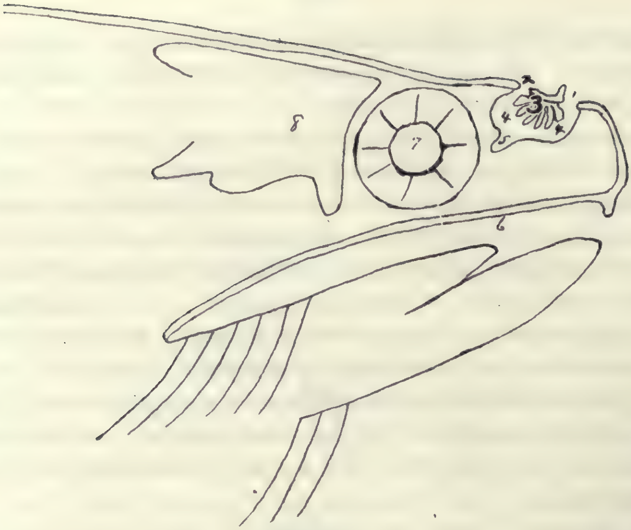


Fig. 1.

Somewhat diagramatic drawing of a section through the nasal fossa of a fish.

1. **Anterior naris.**
2. **Posterior naris (both of which open externally).**
3. **Turbinal.**
4. **Nasal fossa.**
5. **Prolongation of the nasal fossa downward toward the mouth.**
6. **Mouth.** 7. **Orbit.** 8. **Brain cavity.**

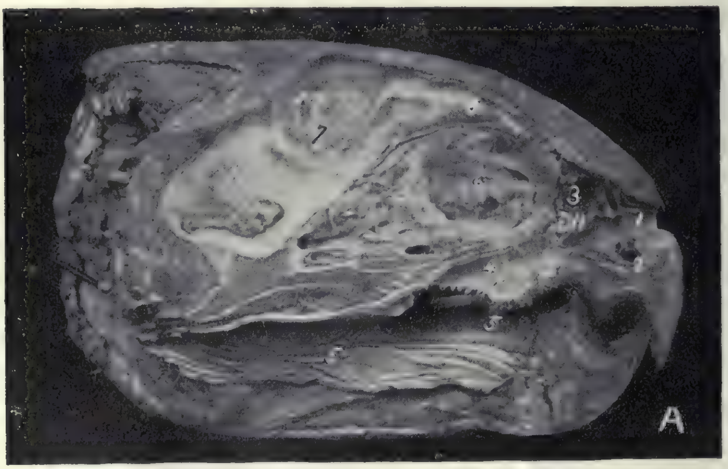


Fig. 2.

Longitudinal section through the left nasal fossa of a turtle.

1. Anterior naris. 2. Jacobson's organ. 3. Olfactory chamber.
4. Posterior naris 5. Mouth. 6. Orbit.
7. Brain cavity.
8. Olfactory lobe of brain and olfactory nerves.
9. Septum.
10. Partition between nasal fossa and Jacobson's organ. In the right fossa this partition has been cut away.
11. Turbinals.

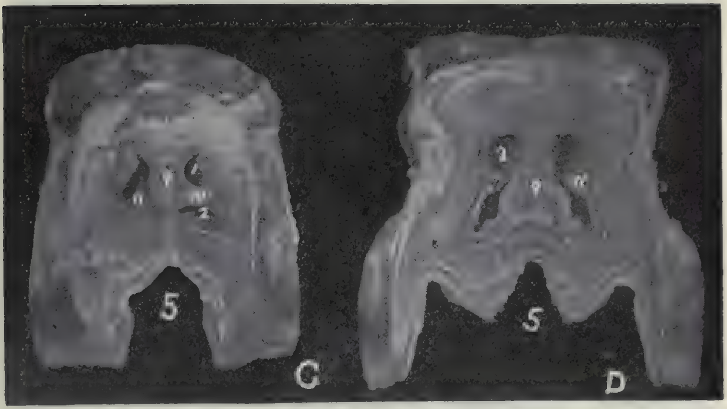


Fig. 3.

Transverse sections through both nasal fossæ of a turtle, looking posteriorly, 3-5-9-10-11, same as on Fig. 2.

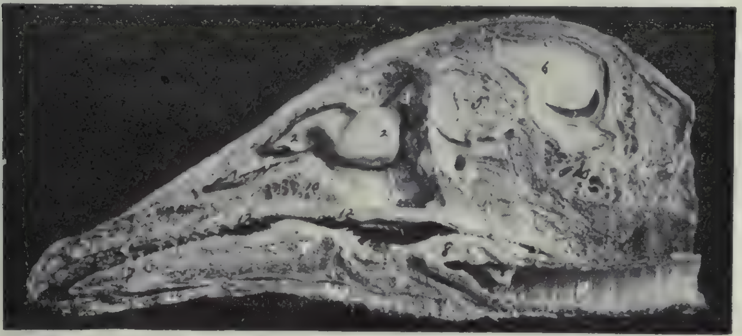


Fig. 4.

Longitudinal section through the right nasal fossa of a duck.

1. Maxillary turbinal.
2. Inferior ethmoidal turbinal.
3. Superior ethmoidal turbinal.
4. Posterior naris.
5. Eye.
6. Brain.
7. Tongue.
8. Larynx.
9. Trachea.
10. Air cells in the bones.
11. Septum.
12. Roof of mouth.
13. Mouth.
14. Inferior maxilla.

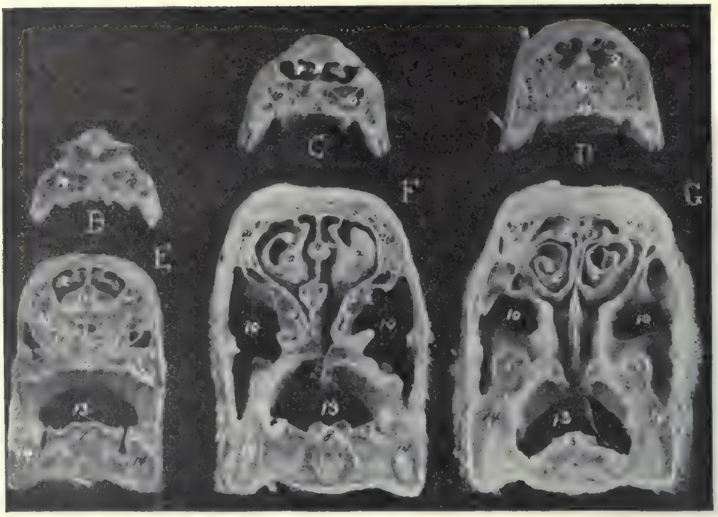


Fig .5.

Transverse section through both nasal fossæ of a duck; B looking anteriorly; C D E F and G looking posteriorly. In B, C and D the inferior maxilla is not shown, 1 to 14, as in Fig. 5.

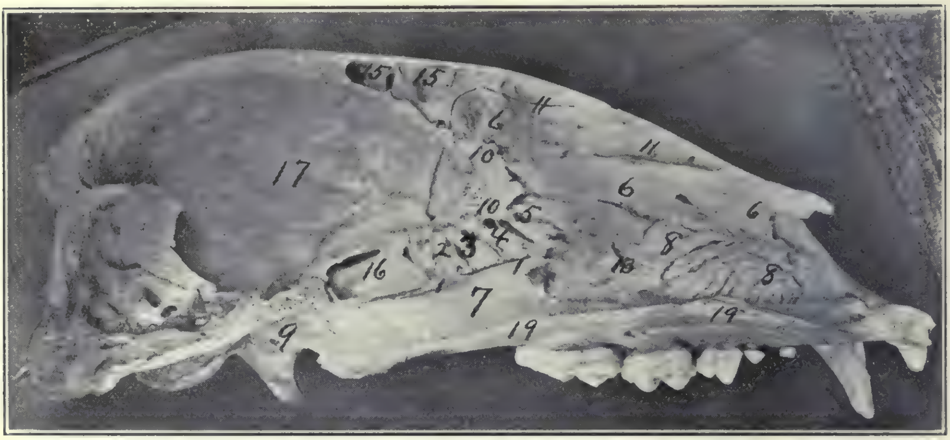


Fig. 6.

Longitudinal section through a bear's skull, showing the left nasal fossa.

1. Lateral wing of vomer.
2, 3, 4, 5 and 6 designate the five ethmoidal turbinals, situated in the olfactory portion of the nose.
7. Part of the respiratory portion of the nose, separated from the olfactory portion by the lateral wing of the vomer.
8. Maxillary turbinal.
9. Nasopharynx.
10. Cribriform plate of the ethmoidal bone.
11. Ethmoidal cells.
13. Ostium maxillare, partially covered by the ethmoidal turbinal.
15. Frontal sinuses.
16. Sphenoidal sinus.
17. Brain cavity.
19. Palate.

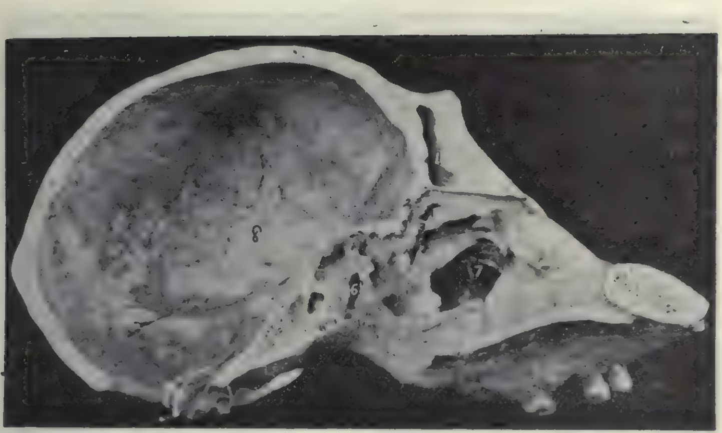


Fig. 7.

Section showing the left nasal fossa of an orang-outang.

1. Frontal bone, cancellous.
2. Cribriform plate.
3. Anterior ethmoidal cell.
4. Posterior ethmoidal cell.
5. Ethmoidal turbinal.
6. Ethmoidal turbinal extending into sphenoidal sinus.
7. Sphenoidal sinus.
8. Maxillary turbinal.
9. Brain cavity.

The turbinals are comparatively simple structures. The maxillary sinus is large and its walls are smooth, except the external lateral wall which presents a decided ridge extending upward to the ethmoidal bone.

The frontal bone is cancellous and there is no true frontal sinus but the anterior ethmoidal cell (3) extends up into the frontal bone.

The posterior end of the ethmoidal turbinal (5) extends into the sphenoidal sinus and divides it into two distinct cavities. The smaller, anterior cavity communicates with the superior meatus through the posterior ethmoidal cell (3). The larger cavity (6) occupies the greater part of the sphenoidal bone and opens into the superior meatus under that part of the ethmoidal turbinal which extends into the sphenoidal sinus.

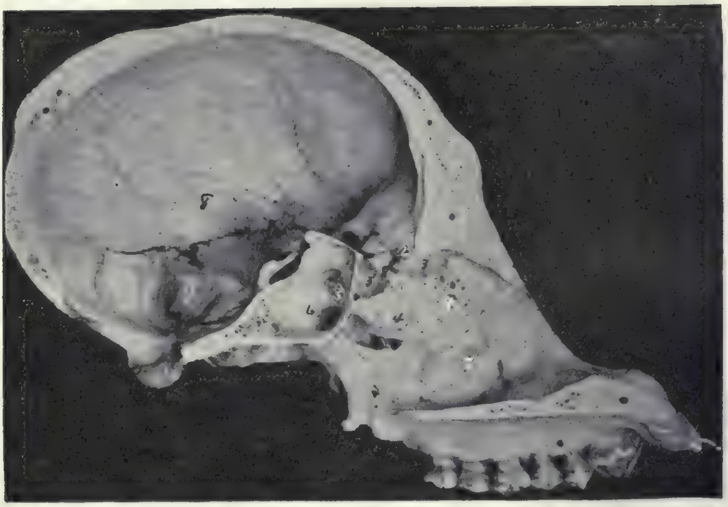


Fig. 8.

Section showing the left nasal fossa of a chimpanzee.

1. Frontal sinus.
2. Cribriform plate.
3, and 4. Ethmoidal turbinal. The ostium of the middle ethmoidal cell is just below the figure 3, and the ostia of the sphenoidal and posterior ethmoidal cells are below the figure 4.
5. Superior sphenoidal sinus.
6. Inferior sphenoidal sinus.
7. Bony ridge on external lateral wall of maxillary sinus.
8. Brain cavity.

In this specimen the maxillary and the inferior part of the ethmoidal turbinal have been lost.

The frontal sinus is large and extends over the orbit; it drains into the anterior ethmoidal cell, which opens into the middle meatus.

The maxillary sinus is large and is partially sub-divided by a bony ridge extending upward and backward across its external lateral wall and roof, and uniting with the ethmoidal bone. This ridge increases in thickness as it ascends and gives off several lateral branches and corresponds to the ethmoidal turbinal which extends down into the maxillary sinus in the dog.

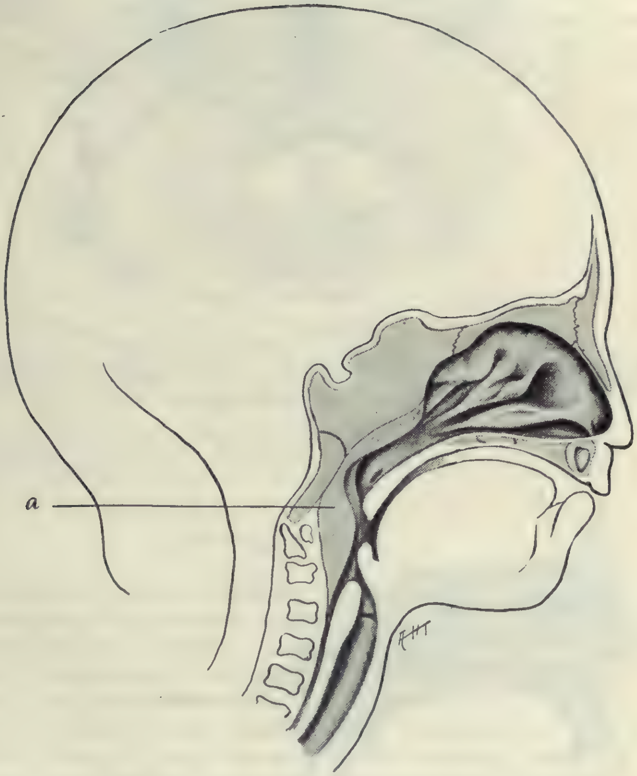


Fig. 9.

Longitudinal section, showing the left nasal fossa, nasopharynx and larynx of a six-months old foetus; a-adenoid tissue. The maxillary turbinate is well developed; four ethmoidal turbinates can be seen; the nasopharynx contains quite a large mass of adenoid tissue; the inferior border of which extends down below the opening of the larynx.

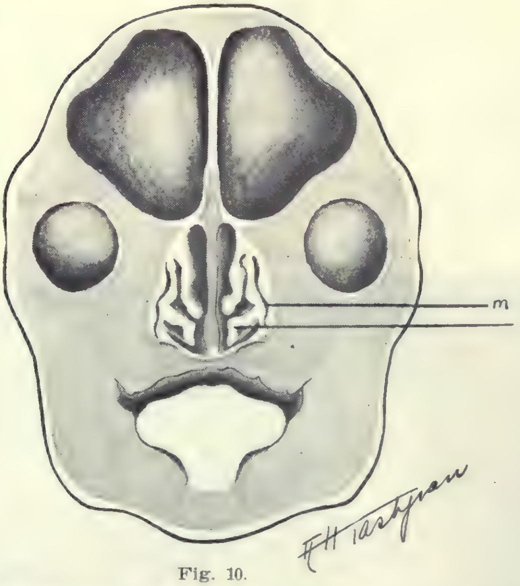


Fig. 10.

Transverse section through the head of a foetus six months old, showing both nasal fossæ; the maxillary sinuses can be seen as narrow cavities with their walls almost in apposition; m-maxillary sinus; i-inferior turbinate.

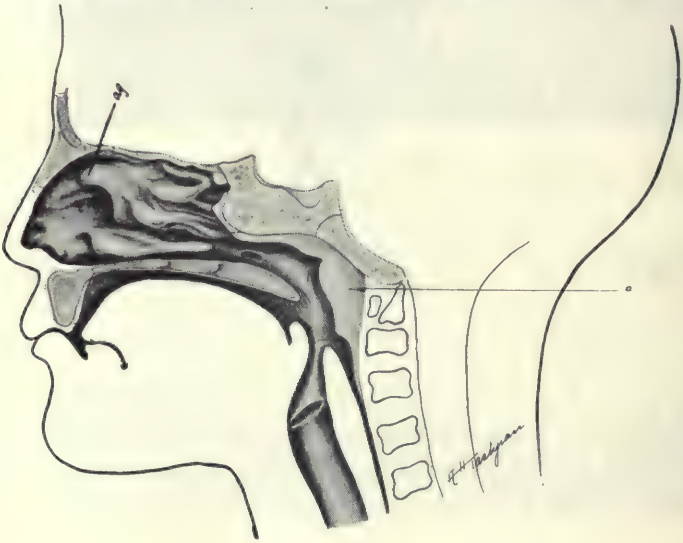


Fig. 11.

Longitudinal section, showing the right nasal fossa, nasopharynx and larynx of a child about six months old. The outline of the maxillary turbinate is about the same as in an adult. Four ethmoidal turbinates can be seen. The agger nasi shows distinctly as a rounded process extending forward from the anterior part of the ethmoidal turbinate. A small diverticulum extending into the sphenoidal bone shows the beginning of the formation of the sphenoidal sinus. The long axis of the Eustachian tube is nearly parallel with the floor of the nose. The nasopharynx contains a rather large mass of adenoid tissue, which extends down below the opening of the larynx. The tongue is relatively thin posteriorly. The larynx is relatively high. A-.—agger nasi; -a-adenoid tissue.

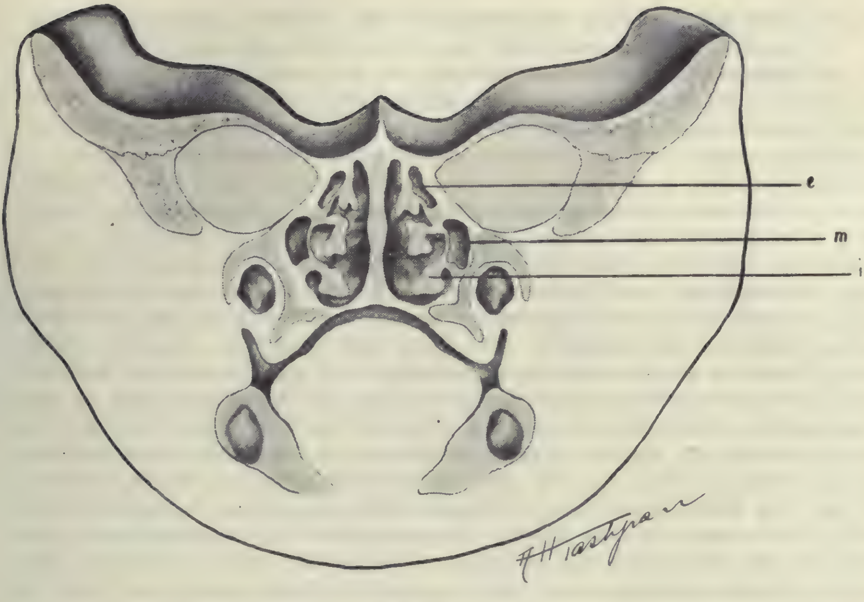


Fig. 12.

Transverse section through the head of an infant six months old, showing both nasal fossæ. The maxillary sinuses show as rather oval cavities. Two ethmoidal cells show distinctly. E-ethmoidal cell; m-maxillary sinus; i-inferior turibnate.

DISCUSSION.

Dr. J. C. Beck, Chicago:—Yesterday afternoon I demonstrated various radiograms from lower animals, and I brought this subject up, not from the comparative anatomy standpoint, but from the standpoint of radiological study of animals' heads, nerves, sinuses and ears, and I also had stereoscopic radiograms of some. They showed very few accessory nasal sinuses. They showed a few cells in the snout, or front part of the nose, and some reaching over the orbit, and upon opening those skulls, mostly of animals which had acute sense of smell and hearing, I found these cells to be very thin small spaces. Now I didn't intend to bring the subject up from the standpoint of study of comparative anatomy of these animals, but simply to demonstrate how the comparative anatomist, by stereoscopic radiography, can make a study of that kind, without breaking the skull to pieces, and some of our very rare specimens cannot be spared.

I am sorry Dr. Ingersoll did not make any reference to the ear. I found the most interesting part of these animals was the ear and mastoid, and I found universally that the mastoid process and the ear itself was one large bullous cavity. Now if these animals which I selected had such a form of mastoid process and middle ear, would it not be possible to presume that the people who have mastoids with large cells had probably a more acute hearing than those that had diploic or small mastoid cells, or after a mastoid had suppurated and become sclerosed or operated on—are not the finer points of orientation spoiled by this obliteration of the cells.

I made some comparative studies and tests in diploic, and pneumatic mastoids in man and I found no difference in the orientation of sound of those, but it was a striking finding in the animals. I was very much pleased to see these pictures, and if Dr. Ingersoll had been present at the reading of my paper we could have learned more about the subject.

Dr. D. T. Vail, Cincinnati:—I think the society is to be congratulated upon having presented before it such splendid demonstrations of the Comparative Anatomy of the Nose, Ear and Mastoid by our members, Drs. Beck and Ingersoll. At first glance it may seem unimportant that we know much about the anatomy of these organs in the lower animals, but when you come to consider deeply into the subject you can clearly see that it is quite as important for us to know something of the evolutionary development of the eye, ear, nose and throat as it is for us to know the human embryology of these structures. I say it is exceedingly important that we have a knowledge not alone of embryology, but also of comparative anatomy. We should have an idea of what these organs are and how we came by them. Every text book on the eye, ear, nose, and throat, whether treating of these subjects singly or conjointly, will contain a certain amount of embryological information, which we all read with a great deal of attention and study, but so far as my knowledge goes, there is not a single textbook of the many which have been published in the past which contains a chapter on comparative anatomy, as illustrated by these splendid demonstrations which have been put before us.

Dr. L .M. Francis, Buffalo, N. Y.:—In making these sections have you noticed any cell in the crista galli which was in communication with the frontal sinus? I ask this quesiton because in making the sections in our work in Buffalo we ran across a specimen which presented a cell in the crista galli directly communicating with the frontal sinus, but it was the first instance that we had ever seen. I have been unable to find any report of such a specimen anywhere else. Upon hearing your paper, it struck me possibly that this cell in the crista galli communicating with the frontal sinus might be some evolutionary remains that had disappeared from man.

Dr. Casey Wood, Chicago:—I would like to ask Dr. Ingersoll whether he has noticed a definite relation between the acuity of smell and the anatomical arrangement of the parts within the nose of the lower animals? Also, to ask whether he has made any experiments to determine the acuity of the sense of smell?

I am particularly interested in one animal of which he showed a specimen, namely, the seal; the smelling apparatus of Phoca has its counterpart in the eye. The seal is an animal whose eye is like bifocal glasses. He has good vision for near both under and above water; the arrangement of his cornea, pupil and lens is such that by tilting his head a little he can use his distance lens and get first class vision in the distance above water, while he gets almost as good sight below. I noticed a corresponding complexity of arrangement of his nasal apparatus in the slide just thrown on the screen.

In conjunction with a colleague I made some examinations of the seal's eyes in the London Zoological Gardens, and I think we were able to establish the fact that the vision of that animal, both above and below water, is acute through the same visual apparatus.

Dr. J. M. Ingersoll, Cleveland, (closing):—The practical point, it seems to me, in this study is this: the accessory cavities of the nose are rudimentary structures, much the same as the appendix is a rudimentary structure. Primarily the nose was a simple affair. As the animals required a more acute sense of smell, the nasal cavities were developed and were filled with turbinal tissue and more olfactory mucous membrane was exposed in a comparatively limited space. Then in animals of a higher type the sense of smell becomes less important to the animal for its maintenance, the cavities are gradually closed off, the turbinals recede, and we get these rudimentary structures the same as other rudimentary organs. As the animal advances in intelligence, and especially in man, the development of the forebrain pushes the anterior part of the head forward. If you remember in the section, nearly all the animals have a cribriform plate in which its axis is perpendicular to the mouth. As the forebrain develops, the cribriform plate is pushed forward and downward, and in apes and in man it is parallel with the roof of the mouth instead of perpendicular to it.

In regard to determining the acuteness of the sense of smell, I have not had time to do any work along this line. I have taken the opinion of the men who have studied it, such as the biologists. In the microsmatic animals (animals with an acute sense of smell) you do find a tremendous development of the ethmoidal turbinal tissue, and in the macrosmatic animals, which are ordinarily spoken of as having a less acute sense of smell, you find the olfactory turbinal tissue is less well developed.

RADIOGRAPHIC STUDY OF COMPARATIVE ANATOMY OF SINUSES AND MASTOIDS OF SOME OF THE LOWER ANIMALS.

JOSEPH C. BECK, M. D.
CHICAGO, ILL.

Introduction. The purpose of this paper is (1) to be a contribution to the comparative anatomy, rather than an exhaustive study of the structures mentioned, namely, sinuses and mastoids; (2) to draw some deductions of the physiology of these structures in reference to man, and (3) to bring out the value of radiography in the study of anatomy, particularly by the stereoscopic method, since by this method one is enabled to determine anatomical facts without cutting or destroying any portion of the skull.

The literature on the subject of the study of the anatomy and physiology of nasal accessory sinuses and ears of lower animals, so far as I have been able to find, is practically limited to the work of Wertheim.

I have selected for my study mostly animals that are known to have acute sense of smell and hearing, in order to compare these functions with those of man.

The order of presentation is based upon the classification as found in Brehm's "Life of Animals (1896):"

Man, (2 slides.), monkey, chimpanzee, little monkey (1 mastoid, 2 sinuses.), tiger, wild cat, domestic cat, lion, German weasel, hyena. coyote, dog, sea lion, squirrel, rat guinea pig, rabbit, sheep, ram (head, horn), deer (nose), stag, pig, sea dog, and manatee (bones). Slides of the radiograms thrown on the screen, pointing out the various important points in reference to the sinuses and ears).

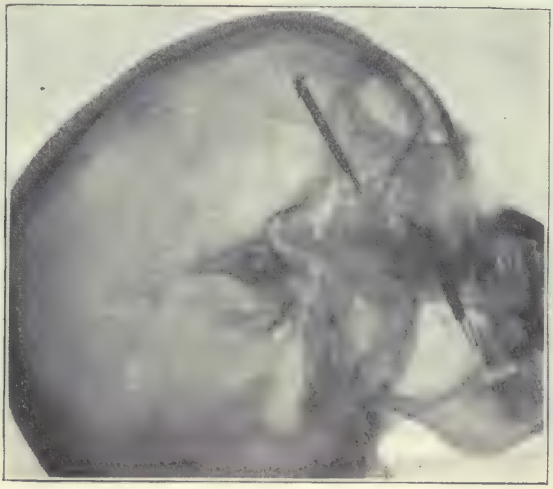
Conclusions drawn from these slides are that, as a whole, the animals have very few regular sinuses as compared to man, namely, frontals and antra. The cells which may represent the ethmoid are shown in some of them, as the sheep, for instance. One can clearly demonstrate, however, the immense cells consisting of the large turbinated bodies. In some of the animals having horns one can demonstrate the extension of air cells into the horns. It being accepted that these animals have such a sharp sense of scent, one may conclude that the sinuses in man have very little to do with the function of smell. As to the other functions attributed to the sinuses of man, I am in no position to make any comparison with the functions of the sinuses of animals.

In reference to the study of the ear in these various animals, we have found that the mastoid process is invariably made up of one large bullous cell, occasionally this being partially subdivided by two or three partitions. It appears that the external auditory meatus, middle ear and mastoid process make up one large cavity. In the examination of some of the skulls, we found the colummella—which represents one of the most important ossicles of the lower animals—passing from the vicinity of the external auditory meatus, upwards and forwards, most probably to the region of the oval window.

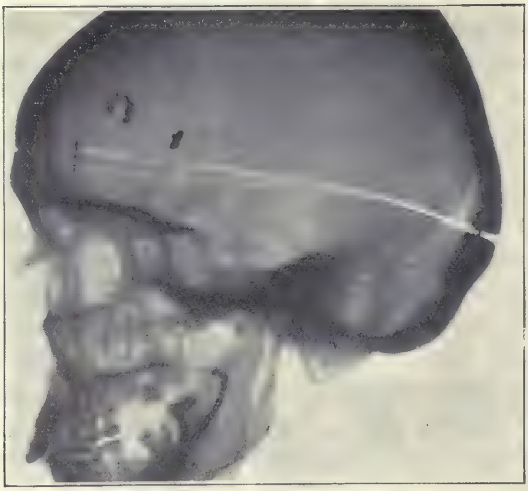
These mastoid processes, which are smooth, oval bodies, are situated on the under surface of the skulls in the vicinity of the foramen magnum and condyloid process of the occiput. In the sheep there is a very prominent styloid process in front of the mastoid.

In drawing any comparative conclusions from these anatomical findings of the mastoid, one may assume that, since most of these animals have such acute hearing, the large-celled, so-called pneumatic mastoid, in the human individual, should possess a more acute hearing than one of a diploic variety. Again, a mastoid which has once been infected and healed out by the process of sclerosis, or a mastoid process which, in consequence of a complete eradication of all its cells as a result of operation, has become obliterated, should influence the acuity of hearing considerably.

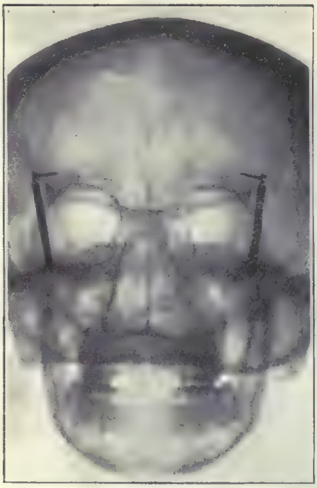
I wish to state, however, that the value of stereoscopic radiography, as shown in these transparencies, cannot be over-estimated, and they will further demonstrate the advantage of studying the anatomy of the human skull, without necessitating dissection or destruction of any part thereof.



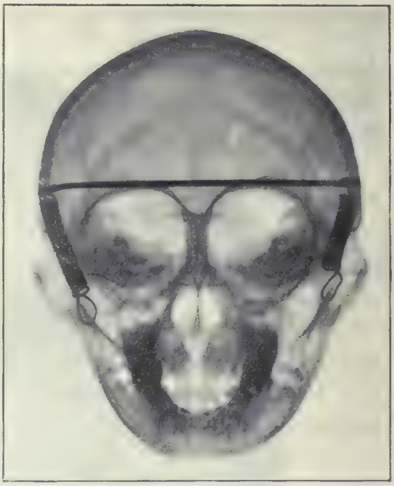
Human Skull (mastoid position).



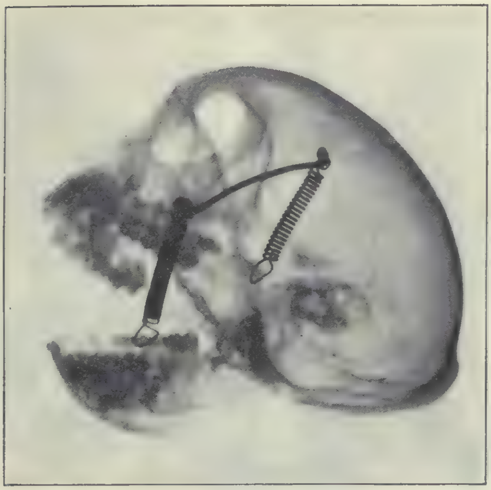
Human Skull (lateral position).



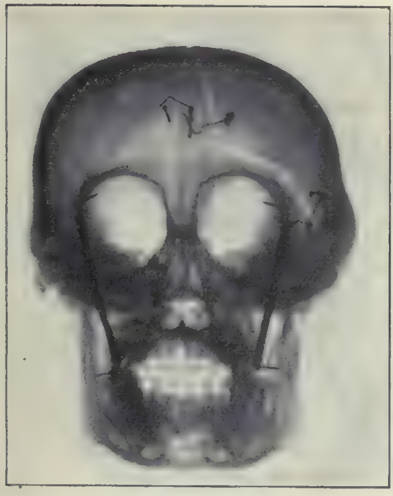
Human Skull
(Postero-anterior position).



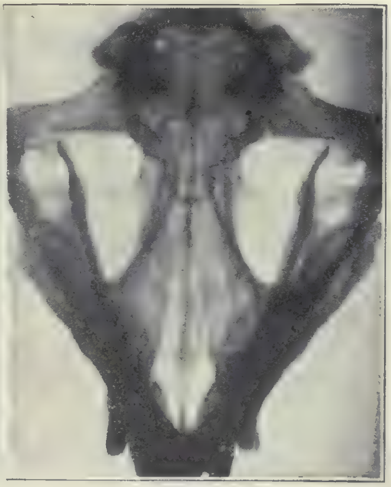
Monkey (front view).



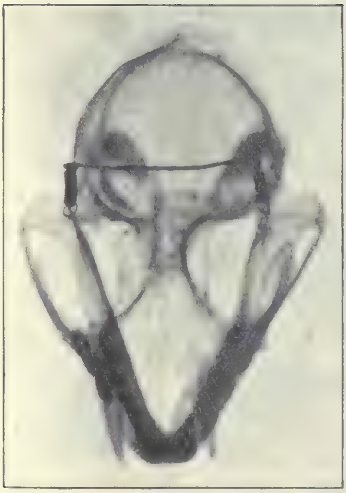
Monkey (mastoid position).



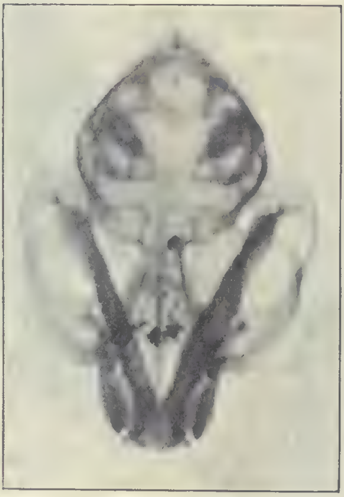
Chimpanzee.



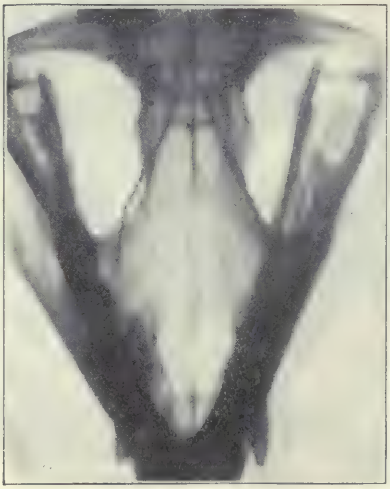
Tiger.



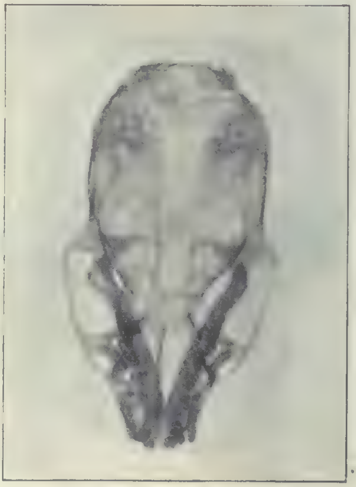
Wild Cat.



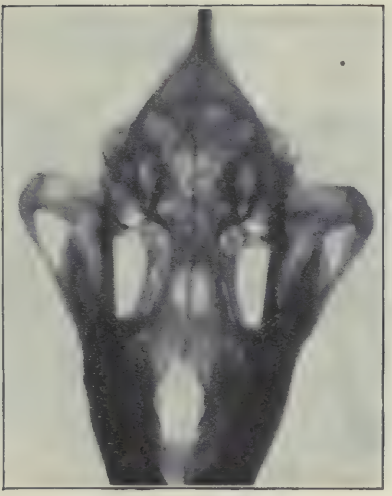
Domestic Cat.



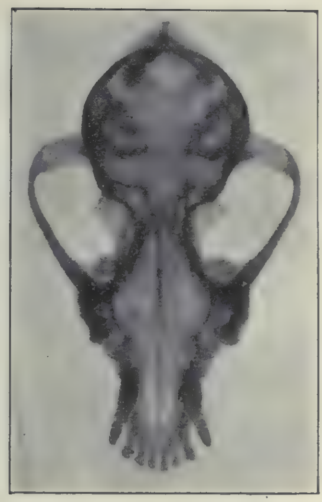
Lion.



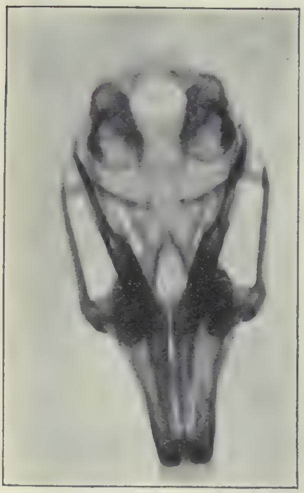
German Weasel.



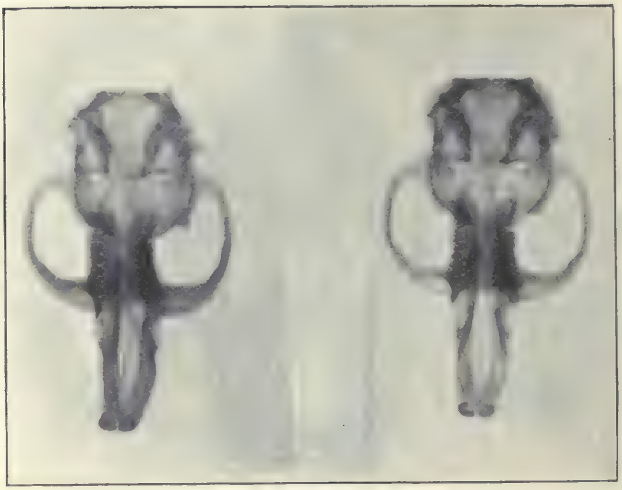
Hyena.



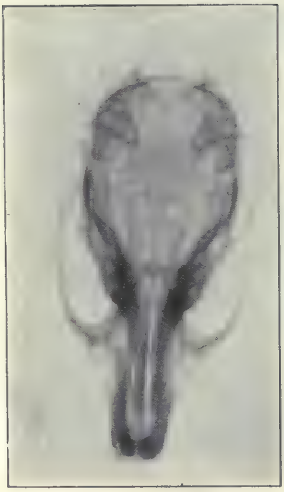
Dog.



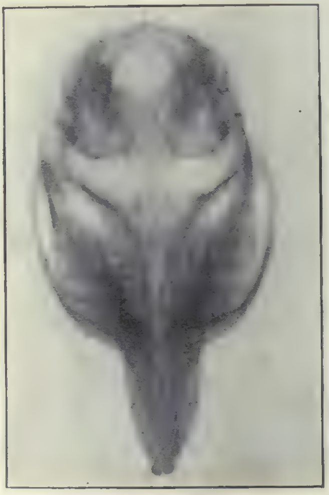
Sea Lion.



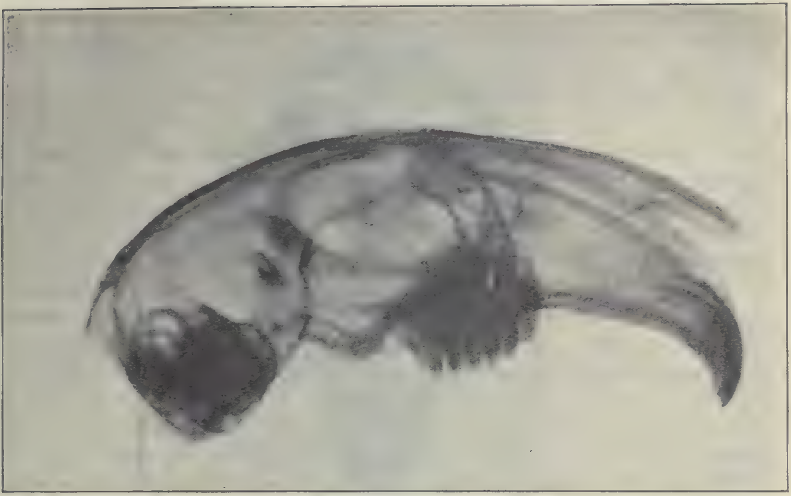
Squirrel (stereoscopic).



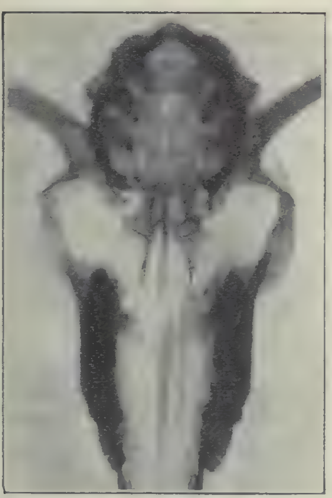
Rat



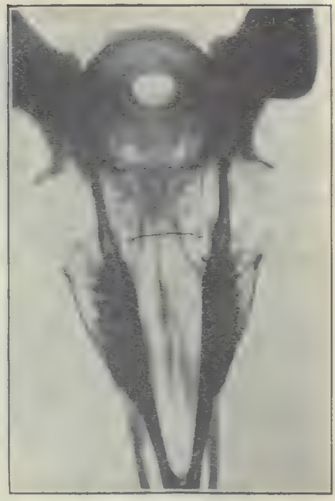
Guinea Pig.



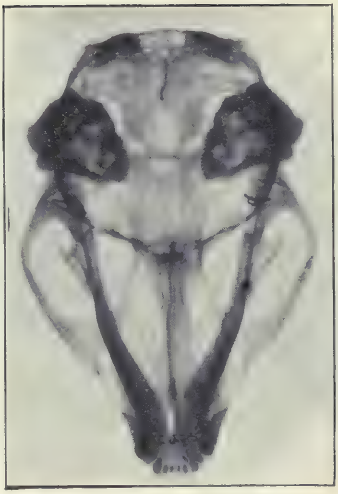
Rabbit (side view).



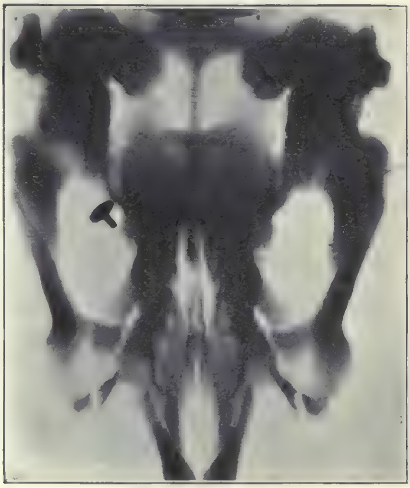
Sheep.



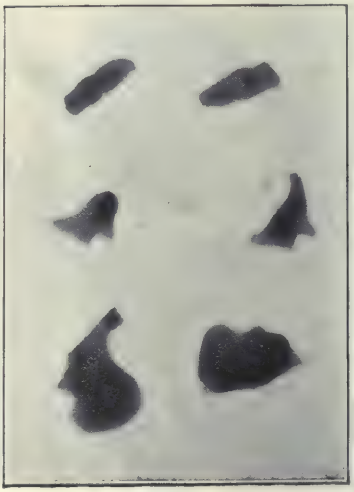
Stag.



Sea Dog.



Manatee.



Manatee Ear Bones.

DISCUSSION.

Dr. J. J. Kyle, Indianapolis:—Have you any slides showing these structures in birds?

Dr. J. C. Beck, Chicago:—I have a large number of radiograms of various birds, but I am not ready to present them, because it is a large subject. I will say for the benefit of Dr. Kyle that the birds have very large sinuses. Those that fly long distances, and ocean birds have extremely deep sinuses. This subject has been touched upon by Hove.

Dr. W. L. Ballenger, Chicago:—I understood the essayist to say that the sinuses were not residual organs of the sense of smell. Now, I don't know anything about this, but I have heard some things about it which, I take for granted, are true. The absence of the antrum of Highmore and the ethmoid cells in some of the lower animals is more apparent than real, that is, the naso-antral wall as found in man is not developed to such an extent in the lower animals; that is, the ostium is much larger in lower animals than it is in man, and therefore, the antrum of Highmore in the lower animals appears to be a part of the nasal cavity, whereas, as a matter of fact, it is the antrum of Highmore. It appears to be a part of the nasal cavity, and therefore, the sinuses in the lower animals are, perhaps, much greater in capacity than he has been led to believe by his study. The lower animals have a well-developed sense of smell, and they have a wide distribution of the olfactory nerve within the sinuses, whereas in man these cells are gradually being cut off from the nasal chambers with which they communicate through small ostia. The sinuses are closed off because they are no longer needed for olfactory purpose.

Dr. J. C. Beck, Chicago (closing)—As already stated, I brought this subject up not from the biological or comparative anatomy standpoint, but as a step for the biologist to work upon. If you study the work of comparative anatomists and biologists, you will find that they tear up all their specimens, but, here is a study of the skull by a method whereby they can save the specimen and still demonstrate it. I know as little, perhaps less, of the subject Dr. Ballenger touched upon than he does, as to the function or physiology of these structures in the animal. I thought I would have to read a little to prepare myself for some one who would attack me on this point. It is stated that these large multi-cellular turbinates in animals are the highly specialized functioning of the sense of smell and scent, and in man they are disappearing. Zwardemacher, I think, gives us a method to test the sense of smell and shows that in more than 50 per cent of the breathing of the normal individual, with no pathological changes in the nose, the sense of smell is only half of the normal, so that as we are going up in the mind we are degenerating in the sense of smell. In normal individuals you will find, if you use his test, that very few will get the middle 3 or 4 of the 11 odors that are employed in the test; they will get the rough odors, but not the fine ones.

AUTO-TOXIC COLDS.

SARGENT F. SNOW, M. D.
SYRACUSE, N. Y.

Every Otologist and Laryngologist who attempts to handle a chronic case has before him at once the problem of controlling the many acute colds or inflammations that occur in the membranes of the nose and throat.

These inflammatory actions are often so slight that the patient has not noticed them, but we find them coming so frequently that they interfere seriously with our efforts to the extent that often in ear affections it is unwise to encourage local treatments.

For fifteen years, the writer has groped after the cause of these recurring membrane disturbances, thinking at first they were caused entirely by morbid intra-nasal states, but later decided that there were always underlying systemic factors to be held responsible. What exact trouble this was seemed obsurce and it was only since I began a closer study of Auto-Intoxication four years ago, that I have felt I had a sufficient grasp of the situation to say what this systemic factor was.

In opening the subject of head colds, I must ask your indulgence for not quoting authorities and literature, as I have been unable to find time to take up the matter from that standpoint; this attempt, then, can in no way be called classical, but I earnestly ask that the views set forth shall have a few moments of your thoughts.

Auto-toxic colds, colds from self-poisoning, or common colds if you like, in the opinion of the writer are a condition induced primarily by toxic substances developed within our own body, a self poisoning from our own bacteria, or other words, a nitrogenous auto-intoxication of microbic origin.

Active inflammation and fever usually mark the limit of toleration by the system for toxic materials. Such an inflammation is an auto-toxic explosion or crisis of elimination; in other words, a *cold* is the expression of an *auto-intoxication* showing itself in the mucous membranes. Those infective inflammations or influenzas produced by bacilli, developed outside of the body, as pointed out by Combe some years ago, are more properly termed *Intoxinations*, not *Intoxications*.

It is now a well developed fact that our intestinal tract is supplied with digestive bacteria that are capable of becoming very abundant and pernicious if not kept under proper subjection by active secretions from the intestinal mucosa, liver and anti-toxic glands. These three barriers protect the body from the harmful action of those digestive bacteria while our glands are kept in healthy activity, but if the healthy activity of the intestinal mucosa and liver is impaired, then our body is not producing anti-toxins sufficient to protect us, and we become prey to our own bacteria. The system then becomes auto-toxic.

According to Combe on Auto-Intoxication, (see Page 9), Marfan is quoted as follows:—"We may say that the microbes intervene actively in all digestive processes, but that besides their undeniably useful role, it is also undeniable that their action transforms the digestive canal, even in normal state, into a receptacle and constant laboratory of poisons."

It is small wonder, then, if they overwhelm us when our body functions are torpid or depressed.

Some people appear to possess a remarkable tolerance for toxic accummulations before it is shown in an irritable or inflamed state of the head membranes, while others quickly show such evidences.

In the first mentioned, we find them so loaded with toxic materials that we must at once get their emunctories into vigorous action if we save them from a severe sickness, others will respond to a simple clearing out of the intestinal canal.

In active head colds or pharyngeal inflammations, we are likely to be forced to unload the system rapidly, not only by the bowels, but by the skin and kidneys. Acid intoxications can be materially reduced by alkaline eliminative solvents. Hot baths and the usual remedies for inducing free perspiration can be made of great help. The whole system becomes one of rapid elimination.

As a rule patients that are auto-toxic take cold frequently and have great fear of draughts; observation will soon show that their tongue is coated, breath likely to be foul, white of eyes dull or yellow, complexion dirty grey and lips too red, or they will show a history of at least irregular bowel action and more often give a history of chronic constipation.

We need have no fear of draughts or exposure except when we are fatigued or loaded with enterotoxins. The draught fetish is a constant menace to our well being. It is true that a person saturated with toxic materials is very sensitive to cold draughts and should be protected, but only until he can be made free of toxic materials, then give him fresh air in wholesale quantities.

While we may have sneezing and a nose stuffed from sitting in a draught, the congestion will pass off readily upon moving about, unless the nasal passages are abnormal or the system is toxaemic.

If it should occur that our patient has a nose obstructed and made unduly sensitive by a deflected septum, outgrowths or turbinal enlargements, the only reasonable procedure is to have these abnormalties corrected. Such intra-nasal defects do not cause actual colds, but they induce such an irritable and occluded state of the respiratory passages that a very slight systemic disturbance will produce marked and continued head symptoms.

Under present modes of diet and life, it is a problem indeed to eat and live so that we do not develop a nitrogenous auto-intoxication. It would seem that the human race either had inherited defective digestive functions, or that our food was far from being the proper sort. Either we must correct the diet, or we must anticipate auto-toxic accummulations by administering a glandular stimulating remedy at such intervals as will anticipate an auto-toxic explosion or crisis. The author finds it necessary to take such a remedy every ten days or two weeks, even though he lives plainly and has regular movements of the bowels twice a day. Many patients will find it necessary to anticipate such a loading up of toxins by an active stimulant to the liver and upper bowel secretions once a week, some once in two weeks. Such a course gives them protection from *intoxinations* through poisons developed outside of the body, and from intoxications through poisons developed inside the body. It also brings them into a state where a fear of draughts and exposure has become a thing of the past. Fresh air has become a luxury instead of a menace. An unwholesome individual has become a being of health and pleasure, not one who insists that every window shall be closed, and his or her associates subjected to the discomforts of a room overheated and poorly ventilated.

It is repeatedly proven to us that our body in a healthy state is an efficient anti-toxic laboratory. Note the extensive operative work that can be done on the mucous membranes of the head without subsequent antiseptic dressings being necessary, simply have our instruments clean and the mucous secretions will take proper care of the wound under all ordinary conditions.

Whether an acute rhinitis or head cold comes from a poison developed inside the body, or comes from a poison developed outside the body, like the influenza, la grippe, etc., the treatment can well be along the same lines, the objective point is the same—to subdue pernicious bacteria by augmenting anti-toxic or bacteriolytic secretions.

A cold is really one of nature's kindliest warnings that our body is becoming surcharged with poisons. The head membranes are good barometers of the system, and prompt heed given to their warnings will greatly reduce our death rate and suffering from rheumatism, tuberculosis, appendicitis, acute indigestion, renal and other functional disorders.

If we, as a profession, had already mastered the problems of correct living, there would be little need of medicine. If we knew how to select, prepare, and proportion our foods but few diseases would bother us, as diseases are largely preventable. We have not solved these problems and will not for many years. The culinary art aims more to tickle the palate than to furnish nourishment, and until greater improvement is wrought along these lines, Materia Medica will have to be a succoring angel.

Accepting, then, the fact that to prevent or cure colds, we must fight digestive irregularities and resulting toxic activities, we should approach these lines of combat in a rational, scientific way.

If our patient is eating too largely of meat and heavy nitrogenous foods, such a diet must be corrected by substituting the proper proportions of lighter, strachy foods; if he is over eating, or taking too much fluid with his meals, those things should be looked into, for intestinal putrefaction is frequently caused by such erroneous habits.

Eating too largely of starchy foods causes fermentation in the small intestines; too largely of albuminoids brings putrefaction in the large intestines; each capable of exciting strong systemic disturbances to the end that we must either solve our patient's problems by prevention through correction of diet, exercise, etc., or by giving relief medicinally, and we all know how unsatisfactory medical relief is except as a temporary expedient.

Preventive knowledge is the great goal of our achievement—our ideal course of study—but we must be practical and until we possess that preventive knowledge more completely and can indicate more definitely the correct dietary modes of life, we must rely upon such relief as can be obtained through medicines.

If we are to combat toxic activities, we must be armed with anti-toxins; and, as our body anti-toxins are produced by our glands and mucosa, we must administer glandular stimulants to make our body manufacture more abundant and active anti-toxic secretions. It is not necessary for me to say what glandular stimulant shall be used. Calomel seems to be the most efficient, though I use it only in extreme or obstinate cases, preferring as a rule a blue mass and colocynth compound. Whatever is chosen, we should be sure to have it followed by a prompt and copious clearing of the bowels, and the dose repeated every two or three days until the tongue is clean, the breath sweetened and the complexion less muddy. Recurrences should be prevented by anticipating auto-toxic crisis as before mentioned.

It is the author's practise to give a medium dose of castor oil or salines between the doses of glandular stimulant, if the auto-intoxication is persistent or active and calomel has been used, the aim being of course to prevent cumulative effects from the mercurial. Under such a plan of medical treatment, I have found no untoward results; on the contrary, am each year more and more satisfied and often surprised with the general good such treatment does the patient, besides preventing their subsequent membrane congestion.

If we are auto-toxic we take cold easily, if we are not auto-toxic we do not take cold. The exceptions to this rule are few—even a cold from exhaustion shows that our body functions are below par, giving opportunity for bacteria to multiply rapidly and produce self-poisoning.

I regret exceedingly that there are not more digestive specialists throughout the country to relieve us of these auto-intoxicated patients; but, until there are we will have to make the best of the situation. Such cases, with their complex problems, are really subjects for more careful, painstaking observations than can be given by a busy operative otologist or laryngologist, particularly so if he attempts to go into the details of diet correction. It is quite easy to note how often the tongue of our throat or ear patient coats up, complexion becomes muddy, appearances indicate billiousness, and the head membranes take on increased congestion, sure indications that toxins are again accumulating in the system and that we should anticipate the impending crisis by a prompt acting glandular stimulant. If such toxic accumulations occur every two weeks, we can wake up the anti-toxic functions a few days earlier; if every ten days, we can give our anti-toxic stimulant once a week, always adapting the medicine to the case.

A glandular stimulant can be given for years with no harmful result if the proper combination is used and reasonable care taken that the patient does not take the remedy as a daily cathartic.

The author has used a pill composed of blue mass, colocynth compound, strychnia sulphate and belladonna for ten years, with not one instance of mercurial poisoning, nor one instance tending to show that a constipated habit had been induced. Such a drug combination does not require an after flushing with salines, and as stated earlier in the paper, is sufficiently effective except in extreme or obstinate cases where nothing acts so well as calomel. When a chronic constipation is complained of, some laxative like the Aloin, Strychina, and Belladonna pill can be used each night with propriety.

If we are able to handle and prevent acute inflammation of the respiratory membranes known as common colds by recognizing and treating the patient's auto-intoxication, what may we not hope will sometime be done with the more grave affections. It appears to the author like the dawn of a new era and he hardly dares let his fancy travel.

It is possible yet that the medical practioner may outstrip his co-laborer, the laboratory scientist, in the race to save life and promote human longevity. Both are engaged in legitimate effort; the one to produce anti-toxins or anti-gens outside the body for injection in emergencies, the other to induce anti-toxic secretions within the body for immunity and cure.

DISCUSSION.

Dr. L. W. Dean, Iowa City:—Have you found a condition of acidosis or pyorrhea alveolaris in this class?

Dr. S. F. Snow:—Not anything that I could offer would be of value. Acidosis, of course, is a common thing, but I have not given it much attention.

Dr. J. F. Barnhill, Indianapolis:—I don't care to discuss all the points of this paper, but I do wish to state my belief that there is more in what the Doctor says than we are usually willing to believe. I am convinced from a more careful examination of the facts in all cases of acute colds that we should give more attention to the system at large than has heretofore been the case in the treatment of the same. There is too much yet unknown concerning the pathology of this disease to discuss it with scientific accuracy, but I believe from a clinical standpoint we can accurately and profitably discuss it. Of quite a large number of the cases of simple turgescent rhinitis, what the Doctor has said is true; but when these cases go further and we no longer have a turgescence but a hypertrophy, or when there is in some of the sinuses a true suppuration, which gives rise to symptoms of continuous colds in the head, then what the Doctor says is not applicable. It is, therefore, in that class of cases where, at each exposure of the patient at an open window, or on the occasion of melting snow there follows the inevitable head cold, we can do more good along the lines indicated by Dr. Snow than by any method of intra-nasal treatment. I especially desire to condemn frequent nasal spraying and nasal medication in the class of patients Dr. Snow has described.

Dr. L. W. Dean, Iowa City:—I would like to make just one point. In referring this class of cases to most excellent internists I have received this report. "After careful examination of urine, and everything, I have been unable to find any positive indication of intestinal trouble, but the patient is not well. We will have to conclude that there is something wrong with him, we have been unable to find anything else, and I feel quite confident the trouble is in the gastro-intestinal tract." A treatment is suggested similar to the one advised by Dr. Snow in his article and with excellent results.

Dr. J. C. Beck, Chicago:—I should like to ask Dr. Snow, since he has given considerable attention to this subject, what he thinks of the diet, or rather the drinking that is so prevalent, of artificial buttermilks, and those tablets that are used to produce lactic acid. And another point, if he has any knoweldge or information on the use of vaccine therapy in these cases. I came across an article some time ago on general medicine, a foreign article, which deals with this subject; and, if he has any information on these points I would like to have him bring it out.

Dr. T. E. Carmody, Denver:—One thing, I think we all forget, the gastro-enterologist forgets, and that is the digestion which should take place in the mouth. It has been brought to our attention by a layman, Horace Fletcher, probably more forcibly than by anyone else. I think if we would do away with dieting and perform more of our digestion in the mouth we would get better stomachic digestion; see whether your patients have sound teeth or whether the gums are affected with pyorrhea alveolaris, or whether they have acid saliva, correction of which will help them a great deal more than dieting.

Dr. S. F. Snow, Syracuse, N. Y. (closing):—In reply to Doctor Beck's question about buttermilk, would say that I am quite in favor of it. I have not used it enough to say a great deal on the subject. I have had my patients use fresh cottage cheese. If I have real bad cases I put them on as complete a diet of cottage cheese as possible. Some will not tolerate buttermilk. The cottage cheese has the lactic acid bacillus. Buttermilk also carries the lactic acid ferment into the lower intestine. I am very much in favor of cottage cheese: that is one of my sheet anchors. I am not well enough posted on diet to feel that I can advise my patients as they should be advised. I am not at all sure that we should have our meats cooked:I am not at all sure that our culinary methods will not be changed in the next ten years, and I feel that as a physician I should have some ready relief or remedy to give my patients. I have tried to find out what will wake up their natural functions, so that they produce their own anti-toxins and can fight off the effect of the bad things they take into the stomach. That is, perhaps, not the best way, but we have to give our patients something that will be good for them. With my cases of chronic deafness, etc., that have toxic conditions, I find out how often they load up, how often their breath bcomes heavy, their eyes yellow, their tongues coated; then I anticipate such periods of intoxication by giving them calomel or blue mass compound twice a week if necessary, to get rid of those accumulations of anti-toxins. When I follow this plan, the patient gets all over the fear of draughts, and has no cold. I can pursue my chronic ear treatments right along, and we get good results; but, if I forget them one week, they are sure to again load up with enterotoxins and have digestive disturbances which will stop the good effects of treatment of the ears. I do not exactly know why calomel does so much good, but it does; and castor oil is another thing that is very efficient. If I had time, I would cite an extreme case of mastoid disease on which I operated, and about 8 or 10 days afterwards, the nurse telephoned me that the patient had a rapid jump in temperature to 105 degrees in the night, which had come down to normal, and was again up to 103 degrees. Naturally I thought I had a case of lateral sinus infection. I found that the patient the night before had eaten stewed prunes. The nurse said it was the first time she had been allowed such liberty, and upon inquiring more closely into it I thought this fluctuating temperature might come from the digestive tract. I ordered 6 drachms of castor oil, and we waited to see the effect before operating. Well, the patient was soon so decidedly better that there was no call for further work, and she made a complete recovery. We will find that a lot of these jumps in temperature are due to troubles in the digestive tract.

As a mastication of course we know how valuable it is to have the digestive process started in the mouth. Those who drink a lot of water along with rapid eating are making themselves the best kind of culture medium for bacteria.

SOME OF MY MISHAPS IN SEVENTY-FIVE CASES OF TRACHEO-BRONCHOSCOPY AND OESOPHAGOSCOPY.

SECORD H. LARGE, M. D.
CLEVELAND, O.

In seventy-five cases of Tracheo-Bronchoscopy and Oesophagoscopy, we have had four deaths, and it is in reference to these fatal cases and some of the troubles we have met in doing this line of work, that I wish to speak about, with the hope you may be able to guard against them.

One of the greatest disadvantages we have to deal with, especially in cases of foreign body, is in not seeing the case immediately after the accident. When so much has been written within the last five years, on the use of the bronchoscope and oesophagoscope, it seems hard to believe that there are physicians in our large cities and their immediate surroundings, who have never heard of these instruments.

One of our latest cases came from a village only twenty miles distant from Cleveland. A child eighteen months old, inhaled a peanut kernel, the family physician on being called, informed the parents that nothing could be done for the child, as there was no way of removing the foreign body, and the child would eventually develop pneumonia, and in all probability die. A Cleveland physician who happened to be in the village in consultation on another case, informed the doctor that the child should be taken to Cleveland at once for attention. The child was brought to Charity Hospital, and the kernel was removed. The operation was performed without any general anesthetic, and did not consume more than ten minutes, but the child never rallied, in fact, the case was a hopeless one from the beginning as the child was at that time in extremo. I feel certain, that, had the child been seen immediately following the accident, it could have been saved.

Another case, a child two years old was brought to the hospital by Dr. Lindsay, from Salineville, Pa. The parents had called the doctor on account of spasmodic attacks of dysponea which had lasted for three days.

On examination he found the left lung partially collapsed on account of very little air going through left bronchus, and made a diagnosis of foreign body in left bronchus. The parents were positive that it was impossible for the child to have inhaled a foreign body. An X-ray was taken but was negative.

At the time I saw the case, there was a well developed pneumonia. Under chloroform anesthesia, an upper bronchoscopy was performed. The right bronchus was completely filled with a shiny foreign body. I was unable at this time to make out the nature of the foreign body, as the outer shell of the bean had been exfoliated. I saw at once that to dislodge the foreign body would be fatal, as it was so large it would not enter the lumen of the tube, or even the glottis. A low tracheotomy was made, and the foreign body removed; I have the foreign body which I show you.

After the foreign body was removed, there was a marked discharge of muco purulent fluid from the left bronchus. At the beginning of the operation, the child's pulse was 180, at the end of the operation, 160. The child died ten hours later; here was another case that might have been saved if seen earlier.

The remaining two cases were esophageal. The first was an adult, who was unable to swallow any solid substance, in fact fluid was passed with difficulty.

Dr. Crile, who referred the case to me, wished to have a specimen of the growth removed for microscopic examination. Under cocaine anesthesia, I passed the esophageal tube, and just below the cricoid cartilage, a large tumor, which had already become ulcerated, came into view. With a pair of cutting forceps, I removed a small piece of the growth, as I thought, but, proved to be on microscopic examination, lung tissue. The patient died twenty-four hours following. No autopsy was permitted, so I am unable to explain why we got lung tissue. No pressure had been made on the tube in passing, and our field of operation was continually under the eye.

In stating the case to Dr. Jackson, he thought there might have been a fistulous opening, and a small piece of lung tissue had been coughed into this opening.

The case was a hopeless one, as the growth certainly was malignant, and it being so extensive, operation was out of the question, but I have always felt that our manipulations may have hastened his end.

The other case was that of a child about one year and a half old, which had swallowed a penny and which became lodged in the esophagus, just below the cricoid cartilage. It has been there for at least three days. Dr. Hammann made an attempt to remove it under chloroform, using esophagus forceps, he was unable to reach it, and referred the case to me. Without an anesthetic, I attempted to pass the small esophageal tube, but was unsuccessful, so chloroform was again given, and I was again unable to get the oesophagoscope tube into the esophagus; there seemed to be a narrowing of oesophagus just above the cricoid, and the opening of the oesophagus was very hyperemic. I was afraid to make any pressure on the tube, and had to abandon the case. Esophagotomy was advised, but as the manipulations had taken considerable time, we decided to wait until morning before operating. The child died the following morning. No autopsy was permitted, so we were unable to give the cause of death. This was the first case I ever met in which I was unable to pass the tube.

The oesophagus is without doubt one of the least resisting structures we have. One must never use any force in passing the tubes, a good direct illumination must always be used, as it is very dangerous to try to pass these non-resisting oesophageal tubes blindly.

I wish to cite some of the troubles one meets in the different forms of anesthesia:

In cases of foreign body in the esophagus of children, I think Dr. Jackson's plan is a very good one, that is, to operate if possible without a local or general anesthetic.

Foreign bodies in the trachea or bronchi, are different, because there is great danger of the child's struggles dislodging the foreign body from a non-dangerous position to a dangerous one.

For a simple examination of the larynx by the direct method, I use no anesthetic. It is easier to operate under chloroform, because the secretions are less than with ether, but in cases where ether is used, I find that a dose of atropin given before the operation, lessons the secretions.

Nervous shock appears quite frequently in the adult, and I think is aggravated by the use of cocaine. We have found that a dose of morphine, given before the operation, has a very beneficial effect.

We used to have trouble in giving general anesthetics, but since we have used this apparatus, (consisting of a bottle, a double bulb and a hand tube, for administering the anesthetic) that trouble has been removed; with it, the anesthetic is entirely out of the operator's way, and the end of the tube can be placed over the opening of the bronchoscope, and the ether forced in by the hand bulb.

I need not speak of the danger of pneumonia following ether anesthesia; especially in those cases of foreign bodies in the trachea and bronchi.

While operating on one of my first patients for a foreign body in the bronchus, under cocaine anesthesia, I had the misfortune to have my accommodation paralyzed, by the patient coughing some mucous that was saturated with cocaine into my eye. I always wear glasses now.

I might mention in reference to wearing of glasses, that it is very hard to keep them clear, and it is the work of one assistant to do nothing else, but warm, clean, and change them.

The X-ray has been a great help in this line of work, but it has its disadvantage. It has not shown the presence of 50% of the foreign bodies that I have met with in my work: Peanut kernels, corn, beans, peas or peanut shells, are not shown on the plate. Sometimes a false shadow appears on the plate, and misleads one.

The laryngologist as a rule has lots of trouble in operating in a strange hospital. There is no operation that I know of in surgery, that needs so many trained assistants. In doing most of our major operations, the surgeon can get along with one assistant, but in doing this line of work, especially of foreign bodies, one is greatly handicapped unless he has at least four or five able assistants.

The changing of house men also works a disadvantage to the operator, as each new interne must be trained for this line of work .

Many of the writers speak of the simplicity of this work. I have found some of the cases simple, and some very difficult. In fact, I would much prefer to do a laryngectomy, or extirpation of the larynx, than to remove some of the foreign bodies we have encountered.

We have had some troubles with the instruments, including the electrical apparatus. In the beginning, our greatest trouble was in not having enough tubes and different kinds of instruments for removing foreign bodies, either the tube was too small, or too large, or the instrument was too large to enter the tube, or not long enough to reach the foreign body.

I would advise the beginner to get the outfit that Dr. Jackson advises in his paper, published in the American Medical Association Journal. I would also advise him to be very careful in the use of the cotton holders, as there is danger of the cotton freeing itself from the catch, unless it is firmly attached. This accident happened to us, only once, but luckily we were able to seize the cotton with the forceps, and remove it before it had caused any serious trouble.

Another point one has to be very careful of is, in seeing that the different attachments of the instruments used for working inside the tubes, are firmly secured into their sockets.

As to electrical appliances. You will have the same trouble as in other electrical appliances, namely: cells becoming discharged, wires becoming crossed, causing short circuiting, or the controller getting out of order. The only safeguard against these accidents, is to test the batteries frequently and always have an extra one on hand. I always carry two electric light controllers, and two separate boxes of batteries.

Lastly allow me to cite a mishap we had in a child four years old, who had inhaled some peanut kernels. The child was the son of a doctor in an adjoining town, and when I saw him, I thought there was nothing to be done as he was then unconscious and very cyanotic. We immediately did a tracheotomy and inserted the bronchoscope, and with Jackson's bean extractor, removed a good sized peanut kernel. The breathing immediately became normal, the pulse dropped considerably, and as the child was in a very weakened condition no further examination was made. For at least two weeks he had a temperature ranging from 99½ to 101. The trachea wound was kept open during all of this time as there was considerable muco-purulent discharge from the opening. At the end of two weeks, the boy expelled through the trachea wound another piece of peanut kernel. After this the temperature dropped to normal, and made an uneventful recovery.

I cite this case to show you how we can be misled in cases of foreign bodies. I thought all the peanut had been removed on the first operation, as, I stated before, the child was immediately relieved when the one piece was removed.

As this work is in its infancy in America, I feel sure that the future operators, will have a lower mortality than ours. I hope that you may not meet with any of our mishaps, and if you do, that you will be in a position to cope with them.

DISCUSSION.

Dr. S. Iglauer, Cincinnati:—I wish to report a case of carcinoma of the oesaphagus in an elderly patient who succumbed several days after the introduction of an oesophagoscope. The obstruction to the oesophagus had been previously delineated by the swallowing of bismuth and the X-ray. A short time after the oesophagoscopy, the patient developed an emphysema of the lower portion of the neck and coughed up a large quantity of foul smelling pus. The carcinoma had undoubtedly invaded the wall of the trachea prior to the examination.

The essayist mentions the value or rather the uselessness of the X-rays in locating foreign bodies that cast no shadow. In this I do not quite agree with him as the following case will show. Quite recently I removed a peanut from the right bronchus of a child aged eleven months. In this case, although the peanut itself, as might have been expected, did not show in the radiogram; still, there was a marked difference in the appearance of the radiographic picture of the lungs, i. e., the left lung apparently was collapsed, and the right lung seemed to be normal. These findings did not agree with the physical examination of the chest and the radiographer and I were not certain which bronchus contained the peanut, but we were certain of a difference in the radiograms of the two sides of the chest. In other words, a radiogram may not always tell you which bronchus contains a foreign body, unless that body is opaque to the rays, but if there is a marked difference between the radiogram of the two sides of the chest, then one is justified in using the picture as an aid to diagnosis.

Dr. J. A. Stucky, Lexington:—I want to emphasize everything Dr. Large has said in this paper and caution beginners not to use force or be in a hurry. Especially be careful about your anesthesia. Since my second case I have used none but the anesthesia referred to, and I am especially pleased with the use of atropia, and in some cases combined with morphine before giving the anesthetic. Another point is this; do not change your assistants. There is no branch of surgery in which team work counts for more than in bronchoscopy and oesophagoscopy. I have had a great deal of trouble in changing my assistants. Third, in oesophagoscopy do not use any force. Only a few months ago a darkey came to me with a history of a bone in the throat; the X-ray picture showed its location, I told them to get him ready for an anesthetic, and when he got up on the side of the bed to put on his slippers to go to the operating room, he coughed a few times, and was dead, from ruptured abcess which emptied into the trachea. If I had gotten him on the table and begun use of the oesophagoscope, I would have ruptured the oesophagus and his death attributed to the operation. Where there is a history of foreign body in the oesophagus, and you have any swelling in the neck, you had better proceed very cautiously. A few months ago I saw a child which had a bone in its oesophagus (here in Cincinnati) and a week after the neck began to swell and deglutition was impossible. I made an incision along the sterno-cleido-mastoid muscle, evacuated a lot of very purulent stuff and found a fistula leading from the oesophagus. The child after a week or ten days made a complete recovery.

Dr. O. J. Stein, Chicago:—It occasionally happens, at least it has been my experience, that there is a suspension of respiration while the tube is in situ, and this has alarmed me on numerous occasions. My first impulse is to pull the tube out very quickly. I do not know why, but I have always done it, and the patients have always succeeded in recovering their breath, somtimes after considerable delay, but a delay that has alarmed me to a great degree. In my conversation with Dr. Large, and appreciating his large experience, I was told that this was wrong; that he never took the tube out at all; he left it in, but went down and tickled the mucous membrane of the trachea. Now that seems good advice, in spite of the anxiety I shall feel in waiting. Perhaps some of you have done as I have done, pulled the tube out and attempted other methods to make the patient breathe. I have thought this suspension of respiration came from pressure on the phrenic nerve.

The question of anesthesia has been a great annoyance to me. I am speaking of general anesthesia. I almost invariably use ether, except in small children. After taking the tube out I have had the same trouble as when the tube is in situ, symptoms of anesthetic poisoning, particularly in cases where there is a great deal of secretion in the bronchial tubes or in the lung, as in bronchitis or tracheitis. Although I have never used atropine, it seems to me that it is the best way of meeting this complication.

Dr. S. H. Large, Cleveland, (Closing):—Speaking of instruments inside the tube, all the trouble comes from the instruments being too large. You do not have to exert any pressure at all. Dr. Iglauer spoke of the accident he had in this malignant case. When we first started in this work we thought we had something that would help the patient with a malignant stricture, but the dilatation of a malignant stricture has been condemned by all laryngologists. You set up a fresh danger of perforation into the mediastinum, and the growth increases immediately after the operation from irritation.

In all of our cases an X-ray was taken, but as I said, these soft bodies do not show in the plate. Dr. Stucky speaks of morphine. Now we do not use morphine, and I got that point from Dr. Jackson, who made this explanation. He said that if the patient was narcotized by morphine, and you have some inspissated blood or mucus, you paralyze the patient's power of expelling it. So after coming out from the anesthetic, if he has any inspissated mucus or blood, he spits it up, and if you have given him morphine he cannot do it. So we now use atropine alone.

I wish also to add my word of praise for Dr. Jackson, who has so well developed this line of our specialty. I consider him the best man in America, and I have seen none in Europe that are better.

Just one word about Dr. Stein's case. Sometimes when the tube enters the larynx or trachea, the patient stops breathing, which is probably due to inhibition through the phrenic nerve. Now the patient is not going to die from lack of air, as the tube lets in enough air. Physiologists tell us that oxygen is contraindicated in these cases, as the carbon dioxide acts as a stimulant to the respiratory centre. We have been in the habit of tickling the mucous membrane of the treachea with a cotton wound applicator.

SYMPTOMS OF TEMPORO-SPHENOIDAL ABSCESS.

L. W. Dean, M. D.
IOWA CITY, IA.

In attempting to discuss this question I realize that we are dealing with one of the most silent areas of the brain, and that there are many abscesses of this region which are practically symptomless. I anticipate that each of us has had the experience of operating on a mastoid and finding an unsuspected temporo-sphenoidal abscess. Sometimes they manifest themselves following a mastoid operation and we might be inclined to consider ourselves responsible for the intracranial complication that was present before the operation. It has been my experience, once early in my practice, to express an opinion after a careful examination of a boy that no intra cranial complication was present and have the patient die within ten days of a temporo-sphenoidal abscess which was undoubtedly present when I saw him. Naturally since then I have never expressed a positive opinion that such a condition was not present.

During the last eighteen months I have had a case of very extensive abscess in this region, regarding which one very expert internist expressed an opinion that there was no intracranial trouble and a second reported that he could find no symptoms of such trouble. Nevertheless there are certain general symptoms which with the suppuration of the ear are very suggestive of trouble to say the least. Often owing to involvement of or pressure on neighboring parts, definite localizing symptoms are present.

I would like to mention a few cases that have come under my observation because they illustrate some of the principal symptoms.

Case I. Patient age 35. Had chronic otorrhoea. For several days diffuse pain on the left side of head; physical and ocular examination negative; temperature ranging from 100°-104°. A tympano-mastoid operation was performed. It had no effect upon the patient's condition. The second day after the operation patient, slept unnaturally sound for five hours. If aroused would remain awake for a few minutes and then fall asleep. A careful examination was again made and no other evidence of intracranial complication was found. A diagnosis of brain abscess was made. Seven days later he returned home. At that time he had the pain in the side of his head and temperature of from 100-101½. Three weeks later he slept all day. On waking he was not sound mentally. He was now a walking patient. He had sensory aphasia for nouns. He could not tell the name of any person, not even of his wife or brother. He knew them but could not call them by name. He knew which name belonged to each person. I gave the patient pen and paper and asked him to write the sentence I gave him verbally. He could not do so. I next gave him a printed sentence to copy which he did readily. When asked to read what he had copied he could not do so. His memory for all words except nouns seemed to be correct. Later, following the drainage of the abscess this sensory aphasia for nouns disappeared. The patient told me he felt like a fool. He wished a cigar, knew what he wanted, but could not get the name. He was placed in the hospital for several days. His temperature remained about 100°. He walked about, smoked and did things as usual. He was very irritable. Mentally he seemed to be all right except for the partial aphasia.

He went home and returned in six weeks. Now he had double optic neuritis, vomiting and motor disturbances on the right side. Temperature was 100°, Pulse 66. He was operated and two and one-half ounces of pus removed from the temporo-sphenoidal lobe.

Case II. Patient age 35. Patient has had recurrent otorrhoea for a number of years. For two weeks he has been very slightly indisposed but has continued working in the cornfield until the day before I saw him. For the last three days he has had great pain in the right side of his face. The morning temperature on the day that I saw him was 100°, in the evening 103°. Only during the last four hours had any change in the mental condition been noticed. During this time his memory seemed to be effected. The patient's gait was unsteady. He had a double sided papilloedema. During the night the patient became delirious and remained in this condition until he was operated on and the next morning when he was operated there was marked rigidity of the muscles of the neck.

An abscess with a discharging sinus was found in the brain and drained. The patient died in the night of the day he was operated and the following conditions were found. (Passed brain around.) An abscess cavity was found in the temporo-sphenoidal lobe containing one and one-half ounces of foul smelling pus. Extending from it to the surface of the brain was a distinct sinus (Fig. 1) through which pus was passing to and from the opening in the d.ura There was suppurative leptomeningitis.

This patient presented two things of interest:

The postmortem examination showed that he must have had the abscess which had been draining through the ear for a long time. The clinical history showed that at least during part of the time that this abscess was present, he suffered no apparent inconvenience. The

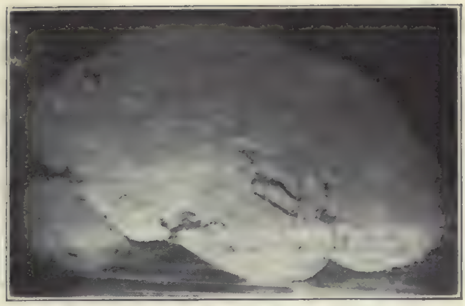


Fig. 1.—Abscess of brain (temporal lobe) secondary to acute suppurative otitis media.

second interesting thing to me was the very severe pain on the side of the face corresponding to the abscess. This pain was so severe that acute empyema of the antrum had been suspected. This pain was only present three days before his death from meningitis which I antipated was from the meningeal complication.

Case III. Age 50. Six weeks before I saw the patient the skull was fractured just above and posterior to the external auditory meatus. For two weeks after the injury he was confined to bed. After this he was up and about superintending his farm. Two days before I saw him he developed a severe pain in the right side of his head. Examination of the patient showed a double sided papilloedema. The pupils were unequal, the right pupil being larger. Both pupils reacted slowly to light, the right more so than the left. His temperature was 100°. Pulse 60. The patient was in a sleepy state. He was able to sit up for a few minutes and was roused sufficiently to make his will. He complained at times of the pain in the right side of his head. The patient was operated.

A triangular piece of fractured bone with the apex piercing the dura was found. The triangle pointed upwards and forwards, the apex being in the squamous portion of the temple. Upon removing the bone a sinus was left in the dura from which pus was discharging. Upon opening the abscess cavity connected with this sinus about two ounces of pus escaped.

Case IV. Aged 19. One year before the patient had had tonsillitis with ear ache in the left ear but with no discharge from the ear. Several months after this she developed pain on the left side of her head. A most excellent otologist was consulted and a diagnosis of hysteria made. When I saw her she had a terrific head ache on the left side. Slight pain on pressure over the mastoid; temperature of 100°; pulse 70. The drum head was normal. The retinal veins were somewhat dilated, not tortuous and there was a suspicion of papilloedema. There were no motor disturbances. A colleague performed a mastoidectomy and found a necrotic mastoid. This did not effect the patient's temperature or pain. Two days later I saw the patient. The temperature was 102°; pulse 110. The patient was delerious and recognized no one; had papilloedema on the side operated. There were motor disturbances on the opposite side of the body and some rigidity of the muscles of the neck. Diagnosis of brain abscess with beginning meningitis was made. The temporal sphenoidal area was exposed and an extra dural abscess with pus under pressure was found between the dura and the bone. Internal and posterior to the antrum was found a darkened area of the dura in the centre of which was a discharging sinus leading into the temporal sphenoidal lobe. The dura was not covered externally with granulations and gave me the impression that the brain abscess had recently ruptured and the pus had drained out through the sinus into the extra dural space. There was no perforation in the roof of the antrum or tympanum that I could find. This patient was of interest because with a normal drum head and normal hearing she had a chronic mastoid trouble with brain abscess. Before I saw her the conditions were such as to result in a diagnosis of hysteria.

Case V. Aged 35. Two weeks before the patient had given birth to a baby. I was asked to see her because of loss of vision with severe headaches. There was chronic otorrhoea on the right side, a double sided papilloedema, a left sided paralysis of the seventh. The urine and physical examinations were negative. The patient was exceedingly weak and seemed distressed. Her mental contition was apparently normal. Incision was made into the temporal sphenoidal region and two ounces of thick pus removed.

Case VI. Aged 20. Six weeks before the patient had a discharge from the left ear. The ear discharged for one week then ceased. Since then there had been severe pain on the left side of the head. Examination showed the mastoid tender, temperature 100°, pulse 65. The patient was much weaker that one would expect an individual with mastoid trouble of this severity to be, but brain abscess was not suspected before operation. A mastoidectomy was performed. The brain was exposed and a small perforation of the dura over the antrum of the mastoid was found. From this perforation a small amount of pus was oozing. The introduction of the handle of a mastoid seeker gave the impression that there was a small subdural abscess.

Case VII. Age 16. For two weeks the patient had a discharge from left ear; was unconcious; temperature 104°; pulse 120, respiration and pupils irregular, muscles of the neck rigid; examination of the fundus negative. A diagnosis of meningitis of otitic organ was made and an operation for subdural drainage was performed. After the dura was opened the brain tissue so bulged into the opening that a ventricular puncture was decided upon. In attempting this puncture, a subdural area of softening was found which had not been suspected before the operation. Patient died.

Case VIII. Age 14. Family history negative. Had much ear ache when a baby. The right ear has been discharging almost constantly since four years old. For two years the left ear had discharged. Three weeks before, polyps had been removed from the left ear. For the last three weeks the patient had pain in the back of the head and frontal region. He complained of being cold and had a number of chills. Three days before I saw him the patient seemed stupid. When I saw the patient he seemed to be all right except for the discharge from the left ear. Dr. Van Epps made a most careful examination and reported that there was no paralysis, no motor disturbance or any other irregularities. The examination of the fundus showed the retinal veins somewhat dilated but no manifest papilloedema. Temperature was 96°, pulse 76, respiration 18.

A tympano mastoid operation was performed. The day following the operation, temperature was 98.6°, pulse 76, respiration 18, and the patient began to clear up at once. Ten days after the operation the patient left the hospital. Four days after he left the hospital he had a severe head ache and became somewhat stupid, an attack similar to the one which he had some two weeks before I saw him. At that time Dr. Van Epps examined him and reported the patient somewhat dull, reflexes and gait normal, temperature ranging from 99° to 102°. Ocular examination, right pupil 3½ mm, left pupil 3 mm, marked papilloedema with some diminution in the left eye. A few days later the boy was apparently as well as ever. The papilloedema persisted. Ten days later I opened the middle fossa and incised the temporal region. On opening the dura no fluid escaped. On puncturing the brain about three ounces of foul smelling pus was removed. The abscess cavity was so large that a second opening, one inch lower, was made and drainage secured in each. Three weeks later the boy died, suddenly with elevation of temperature the pulse becoming exceedingly rapid and the respiration diminishing. The postmortem showed a rupture of the abscess in the lateral ventricle.

The following is the report of the post mortem examination made by Prof. Albert.

In the posterior portion of the inferior or third temporal convolution were two openings apparently artificially made leading to a suppurative process within. These two openings were about an inch apart, one slightly above the other. A cross section of the brain was made anteriorly to these openings which demonstrated the existence of two distinct circumscribed collections of pus separated by about one-fourth of an inch. One of these extended to within one-eighth of an inch of the external surface and produced a distinct bulging. A section made one inch anterior to the one just mentioned showed two areas of pus still more widely separated,—in this case one inch. The area near the surface was three-eights of an inch in diameter and extended to within one-sixteenth of an inch of the surface. Just posterior to this area is an area of dense tissue, more dense than brain substance in consistency, of a translucent appearance with the exception of a strip about the center, which is of a yellowish-white color. A section of this tissue was taken for microscopical examination.

The other abscess measured one-half inch from above downward and one inch from side to side. It extended to just beneath the lateral ventricle. The surface of the lateral ventricle just adjacent to it was found to be inflamed and the ventricle itself to contain a slight purulent exudate.

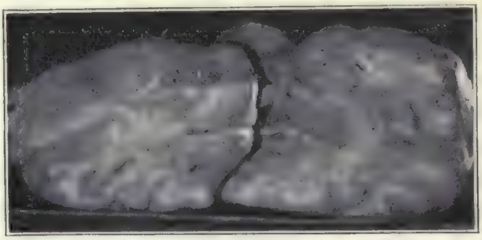


Fig. 2.—Abscesses (2) of brain involving temporal lobe. Section through brain was made one inch posterior to optic chiasm.

Abscess No. 1 near surface; xternal was a rather large mass of dense fibroblastic proliferative inflammatory tissue with a linear area of hyaline degeneration extending through it.

Abscess No. 2 lies a little below and extending to the lateral ventricle. The lateral ventricle was somewhat hyperemic and contained a slight amount of purulent exudate at this point.

Another section was made from the brain about three-fourths inch anterior to the last one and which cut through the optic chiasm. This section revealed the presence of a considerable amount of pus in the descending horn of the lateral ventricle. A section made one-half interior to this revealed the presence of pus in the white substance separating the fibres anterior to the anterior end of the descending horn of the lateral ventricle. This continued anterior for another inch or within two inches of the anterior end of the brain. The internal capsule was not involved at any part. It will therefore be seen that there were two abscesses, the smaller one about one-half inch in diameter and two and one-half inches in length. This one remained near the surface of the lower temporal convolution and lead to the purulent localized inflammation of the meninges covering that portion. The other abscess began posteriorly two inches anterior to the posterior end of the brain, opening posteriorly through the artificial opening made into the middle and second temporal convolution and extended anteriorly to descending horn of the lateral ventricle, then extended some distance and inward just two inches when it was continued anterior in the descending horn of the lateral ventricle, extending some distance anterior to the anterior end of the descending horn as already described, making in all a process four inches in length.

Microscopic Examination.

1. Portion of brain from inferior temporal lobe from a section made from the brain about one inch posterior to the optic chiasm. The greater part of the pathological area consisted of sub-acute and partly chronic fibroblastic proliferation, along the centre of which was a linear area which had undergone hyaline degeneration; to one side were a large number of pus cells (abscess).

2. Exudate from descending horn of lateral ventricle taken from section of brain cut througth optic chiasm of about one inch anterior to the section from which No. 1 was taken. Exudate consisted entirely of pus.

3. Section of brain with some exudate recognizable to the naked eye taken from the white substance of the temporal lobe anterior to the anterior end of the descending horn of the lateral ventricle. The exudate which had separted some of the brain fibres consisted entirely of pus.

It is interesting to note in this case the fibroblastic proliferation with the hyaline degeneration. This shows the strenuous effort on the part of the organism to overcome this condition. It also shows that this pathological process must have been present for a long time. It is interesting to note that here we have an exceedingly large abscess in the temporo-sphenoidal lobe which must have been present for a long time, the patient not exhibiting the general symptoms of brain abscess or presenting practically no symptoms of intracranial disturbances.

Case IX. Patient age 60. Four months before the patient had suffered from la grippe with much pain on the right side of the head. At no time had there been a discharge from his ear. This very severe pain had persisted for four months and was present at the time the patient presented himself to me. The patient was exceedingly emaciated and weakened and gave one the impression of being very much distressed. The ocular and general examination was negative. The drum head was slightly reddened, the mastoid region was painful on pressure. A mastoidectomy was performed. The whole of the mastoid was found diseased. There was a perforation of the inner table of the middle fossa and a large extra dural abscess was found. After thorough removal of the bone a large extra dural perforation was discovered. The opening was covered by a mass of granulations. It was large enough to allow the passage of the handle of a scalpel and was introduced an inch into the opening without meeting any resistance. Roughly estimated, an ounce of pus was divulged upon pressure on the neighboring brain tissue. This cavity continued to discharge for four days after the operation.

Case X. . Age 16. Had an abscess in his left ear when two years old which was accompanied by an abscess back of the ear. Since that time his ear has been discharging. Recently he has been having very severe pain on the left side of his head. Physical examination was negative. Retinal veins of the left eye distinctly dilated and tortuous Temperature 99°, pulse 70.

A tympano mastoid operation was performed. The dura of the middle fossa and over the lateral sinus was necrotic and perforated. There was a large extra dural collection of pus. A little external to the roof of the antrum was a perforation of the dura from which pus flowed. The perforation in the dura was so large that the handle of the mastoid seeker could be readily introduced a distance of one and one-half inches at right angles to the surface of the brain, indicating a rather large cavity. At the end of a week this sinus ceased to discharge.

Case XI. Age 38. Patient had been under treatment for chronic otorrhoea on the left side, and for syphilis of the nose for a year. With the exceptions of these conditions she was apparently well until June 24, 1910. On that day she became unconscious. When I saw her she had a temperature of 104°, pulse 140, respiration 34. There was a constant twitching of the lids of the right eye and of the right side of the face. There was a partial paralysis of the third nerve on the right side. The fundus examination was negative.

The patient came to the hospital for operation for brain abscess. The diagnosis did not seem to be at all clear so the patient was kept under observation for thirty-six hours by the internist. The blood count showed a leukocytosis of 86000, a polynucleosis of 89%. A positive diagnosis between syphilis of the brain and abscess of temporosphenoidal lobe could not be made. As it was apparent that the patient was going to die if nothing was done, it was decided to puncture the left temporal lobe. The middle fossa was exposed. The meninges were bulging. Thorough exploration of the temporo-sphenoidal lobes did not discover any pus. The operation had no effect upon the patient whatever. The patient died a day and a half after the operation.

Postmortem report as made by Dr. Albert is as follows:

Naked eye examination revealed the presence of a hemorrhage in the lower part of the fissure of Sylvius on the left side, the hemorrhage being beneath the pia mater and involving also the adjacent cerebral cortex. The source of the hemorrhage was apparently the rupture of a small aneurysm of the middle cerebral artery. The brain was cut across just posterior to the fissure of Syvius and again in the cerebrum. An area of softening was found in both cerebral hemipheres. The area in each hemisphere is of a light color with rather indefinite border about an inch and a quarter in diameter, involving the internal capsule, caudate and lenticular nuclei and optic thalamus. A smaller area of softening was also found in the cerebellum on the left side.

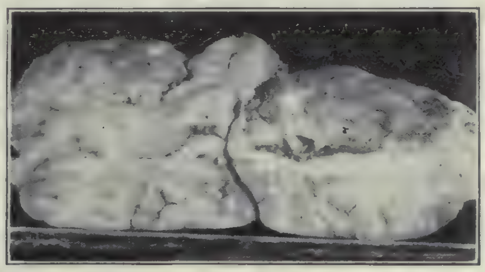


Fig. 3.—Section of brain made through optic chiasm and presenting pus in the descending horn of the left lateral ventricle.

Section taken from brain about one inch anterior to the one which presents the two abscesses, one just beneath the external to the lateral ventricle.

Microscopic examination revealed the meningitis of a chronic nature with an acute exacerbation, but not prolonged in character involving the meninges of the left temporal sphenoidal lobe and most marked at the anterior tip of the lobe. Both middle cerebral arteries presented evidence of a sub-acute endarteritis. This was most marked on the left side. Softened areas were evidently of recent origin and were probably in part post-mortem. They may be accounted for in part (possibly though not probably entirely) by the endarteritis of the middle cerebral vessels. I was unable to determine the cause of the endarteritis and mild degree of meningitis unless syphilitic in nature.

Dr. Albert expressed the opinion that the softening of the brain had not been present for not more than six days. The meningeal hemorrhage was undoubtedly responsible for the motor troubles on the right side of the face. I mentioned this case as one where it was quite impossible to make an exact diagnosis and to show that other conditions may simulate those of temporo-sphenoidal abscess.

Judging from these cases and those reported by others we might summarize and say that the symptoms of temporo-sphenoidal abscess could be devided into two classes: First the general symptoms which are characteristic of all brain abscesses, and secondly the focal symptoms.

As general symptoms we have the headache, mental depression, loss of weight, general appearance of being seriously ill, optic neuritis, a slow pulse, and variations in temperature. The temperature varies with the stage of the abscess. In the early stages there is a high temperature accompanied by chills. This is shown nicely in the formation of abscess following operation on the brain. Later, in the majority of my cases we had a temperature of about 100°. In two cases the temperature was sub-normal. In McEwen's series as reported in his work on "Pyogenic Disease of the Brain," most of his cases had a sub-normal temperature. Marked slowness of the pulse as reported by McEwen was not always present. The presence of meningitis would increase the pulse rate and also the temperature. Two of the cases presented the somnambulistic state also mentioned by McEwen, this condition however, in each case lasting only for a day. In case II this was practically the only symptom which should always direct our attention to this condition. Optic neuritis was present in 70% of our cases. It was, however, a late symptom, appearing in two cases after the diagnosis had been at least strongly suspected. Pupillary phenomena are usually present.

Vomiting in my cases only appeared as a late symptom. Convulsions are mentioned by McEwen as being a prominent symptom of this condition but none of my cases presented them.

The focal symptoms of temporo-sphenoidal abscess, indicated by cases recorded are: speech disturbances when the abscess is on the left side, from involvement or pressure upon the third frontal convolution; paralysis on the opposite side of the body from pressure upon or involvement of the motor area; the face, arm, and leg should be involved in the order mentioned. McEwen also mentions word deafness when the upper part of the temporo-sphenoidal region is involved; also paralysis of the third nerve on the same side from pressure. He says that he has never seen the internal capsule involved in a temporo-sphenoidal abscess. If the lesions are so large as to extend into other portions of the brain, there necessarily will be symptoms characteristic of lesions in the part affected.

Perhaps the most important conclusion that may be drawn from a consideration of these cases is that a temporo-sphenoidal abscess may be present with symptoms that would suggest the condition. Especially may this be the case if a discharging sinus is present. The only manifest result of the condition may be a slight general disturbance which could readily be accounted for by the presence of a chronic mastoiditis; because of this, it is well in every operation to seek for necrotic bone lying against the dura and, if found, remove it throughly and make a careful examination of the dural surface.

Even when we have a general mental disturbance with optic neuritis, a diagnosis of brain abscess should be made, because this condition may be produced by an extra dural collection of pus in the middle fossa. I have known patients to have the symptoms that were present in cases VI and IX and be relieved completely and permanently by the drainage of an extra-dural abscess where there was no perforation of the dura mater.

Case XI would indicate that temporo-sphenoidal abscess cannot be differentiated from syphilis and other conditions involving the temporo-sphenoidal lobe.

Two cases would show that the aural examination for chronic otorrhoea must not always be positive. One case had mastoid trouble with abscess of the brain without ever having had a discharge from the ear.

The latent period is shown very nicely in two cases. How long this latent period may last I do not know, but I anticipate in some cases it may be for years. The formation of fibroplastic tissue in case VIII would indicate that perhaps it is not impossible for abscesses to disappear without external drainage as reported by McEwen, leaving behind only scar tissue or encapsulated pus with complete disappearance.

In closing, perhaps, it might be well to mention that the contraction of scar tissue after operation for temporo-sphenoidal abscess or the contraction of scar tissue which has been formed from an abscess that has drained itself or has become encapsulated may be a causative factor in obscure brain lesions.

DISCUSSION.

Dr. J. A. Stucky, Lexintgon, Ky.:—The paper is most instructive and impresses upon us the important lesson that we as otologists must teach our patients more fully concerning the misleading and treacherous symptoms of chronic otorrhoea. I have had some very painful experiences with one or two cases of chronic otitis media, wherein I did not suspect brain trouble, and did not urge an immediate operation; and, much to my chagrin, a few months afterwards they had secondary trouble, finding an old brain trouble which had existed, as in some of Dr. Dean's cases, for weeks, and probably months. So I believe it is our duty to impress upon our patients the danger and treacherousness of chronic middle ear disease, especially where the drum is destroyed, no evidence of ossicles, and chronic granulation tissue is present.

Another point I want to emphasize is the necessity of having a postmortem examination in our fatal cases. We must adopt the methods of European otologists and teach the Americans the necessity of allowing us to examine the cases of suspected brain trouble after death. It is the fatal cases that teach the lessons which will enable us to save the cases which come to us in time for operative procedure, to do any good.

Dr. P. Fridenberg, New York City:—The practical importance of this subject is so great that I may be allowed to add one or two points of practical interest from the ophthalmological standpoint. During the last five or six years, I have had occasion to see a number of cases of actual and suspected brain abscess at Mt. Sinai Hospital, where all such cases are subjected to a careful functional and physical eye examination. There is no doubt, as the essayist has already mentioned, that a temporo-sphenoidal abscess may offer few, if any, pathognomonic symptoms; on the other hand, it does occasionally present quite unequivocal signs. As to the aphasia, this term is a little misleading, and the symptom which is characteristic, may easily escape notice unless we examine especially for it. These patients seem to speak fluently and often have good memory. They know their name, age, etc., and unless specially tested, do not appear aphasic. However, if you hold up and object to them, even one with which they are familiar, they may be absolutely unable to name it. Thus, if a cigar is shown them, they will say they know what it is, that it is "something to smoke with,"—"tobacco"—evidently searching for the name. If you ask if it is a pipe, they will say "no"; if you ask, "Is it a cigar?" they will readily assent. So it is evident that both the naming centre and the perception centres are intact; it is the association tract between them which has been destroyed by the abscess. It is almost always subcortical. This word-blindness, when present, is almost pathognomonic, and even syphilis of the temporo-sphenoidal lobe, as far as I remember, does not present this defect.

Another important sign is that of homonymous hemi-anopsia which is particularly valuable as aboslutely indicating the side of the lesion, about which we are often in doubt when focal symptoms are not marked. As Dr. Dean has already said, confusion may be caused by some contra-lateral paralysis, due to a complicating hemorrhagic meningitis; but even without inflammation of the meninges or hemorrhage, mere pressure by an extremely large abscess may be sufficient to put out of action the centres of the opposite side of the brain and thus cause a confusing paralysis, say of the facial, or of one extremity.

Another interesting and important sign is that of the hemi-anopic pupillary reaction of Wernicke, in which the pupils will react normally to light thrown in from one side, while they will remain rigid when light is thrown in from the other and affects only the hemi-anopic blind half of both retinae. Now, this reaction indicates blindness associated with a lesion of the pupillary centres or tracts in the neighborhood of the chiasm, while, when the cause of blindness is in the cortex, or sub-cortical, the pupillary tracts are free, and we have hemi-anopsia without this peculiar pupillary reaction, a very characteristic and instructive symptom complex. Optic neuritis may be absent or come on very late—too late to be of benefit as indicating the necessity for operation, whereas hemianopsia may be a very early sign and perhaps for that very reason is often overlooked.

Many cases of brain abscess are made clear by the previous history of mastoid suppuration, often necessitating a radical operation, but in other cases there is no such clue. Some of the patients I saw were not in the ear wards at all. They were admitted to the surgical department for obscure intracranial symptoms suggestive of brain tumor, or they were in the medical wards. And, the question then arose whether they were to be subjected to decompression operation, or whether the otologist could find any evidence of aural source of infection. Very often this is a difficult matter to decide, say in a case where there has been known mastoiditis with labyrinthine infection, which has been successfully operated on and apparently been cured. There may be a suppuration in the other ear without any evidence of mastoid or labyrinthine involvement. On which side are we to operate? Here, particularly, the aphasia and hemianopsia may be valuable guides.

Now just one word about the operative technic, or rather the choice of site of attack. Definite proof of previous otitic infection helps us in two ways. In the first place, we know that an overwhelming majority of temporo-sphenoidal abscesses begin in close proximity to the area of diseased bone or dura, near the mastoid antrum, or the petrous portion, so that in opening up the skull from this point we have comparatively good chance of striking the abscess with a minimum of exploration. In fact, we are often guided by actual evidence of progressive infection, such as localized collection of pus, a fistula, decayed bone or discolored dura. Then too, if the symptoms have been caused, as in some cases mentioned by Dr. Dean, by an extra-dural abscess or an accummulation between the brain and meninges, such foci can be attacked and rendered accessible almost immediately with very little trouble. Finally when we have opened the abscess at its most dependent part, drainage is effectual, and this is not the case when, as is sometimes advised, we open the skull some distance above the mastoid, and then search for the abscess in various directions. Even if found and opened under these circumstances, drainage is very difficult and incomplete.

Dr. S. J. Kopetzky, New York City:—When all is said and done, we have no positive means of diagnosing the existence of temporo-sphenoidal abscess. Occasionally we get symptoms of otorrhoea cerebri, and to some extent the retinoscopic, and visual field examination may furnish data of moment. A critical study of the patient's history will often result in showing periods of indefinite sensations of dizziness, nausea, and general malias. These might be interpreted as irritative symptoms from such an abscess, but they might as likely come from gastro-intestinal disturbance. Dr. Dean is to be commended and the Section congratulated upon the detail with which he has reported his cases, and we hope that by a further study of just such reports as carefully worked out, light will be thrown upon this obscure lesion.

Dr. H. B. Young, of Burlington, Iowa:—I wish to report a case operated on a few years ago. I was called on to see a boy, eight years of age, which had scarlatina followed by middle ear abscess, which eventually got beyond the attending physician. Its pulse and temperature was of the steeple-chase variety; it was aroused with difficulty, and was paralyzed on the opposite side. There was a general swelling of the canal walls, and a thin dirty looking discharge. There was absolutely no sign of trouble back of the ear. I found sclerosed bone; but eventually opened the antrum. The pneumatic spaces were very small and absolutely impervious to the curette. After feeling around, I found a soft spot around the zygoma and curetted it very carefully, but was unable to find any communication with the middle fossa. I then went back and uncovered the lateral sinus, which was apparently healthy. I stopped at this point, although I felt the middle fossa should be opened; but the father had insisted that nothing further should be done. Within twenty-four hours after this operation, the patient came back to consciousness; within a week the temperature was normal; within six weeks, was out in a wheel-chair; and within six months, had recovered from his hemiplegia. The question naturally arose, with all the symptoms present, did we have an epidural abscess or did we have a circumscribed serous meningitis contiguous to the bone involved in the process of suppuration. I naturally had no chance for a postmortem, and my diagnosis has never been certain.

Dr. L. W. Dean, Iowa City, Iowa, (closing):—In answer to Dr. Sherman's question will say I tried to confine myself to the title of my paper, the symptoms of temporo-sphenoidal abscess. Case No. 1 died from an infection about two months after the operation. The operative technic in each one of these cases, with the exception of the last, which was operated on since I wrote the article, will appear in the November Annals. We tried a series of methods of drainage on these cases, and I believe if you take the trouble to look them up, you will find the report of some interest.

THE PRESENT STATUS OF LABYRINTHINE SURGERY.

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Since 1895, when Jansen first suggested the operative opening into the labyrinth to combat its purulent invasion, a great number of observations have accumlated, and many modifications of the operation on the labyrinth have been advocated. To Jansen who led the way in surgical technique and Barany who developed means of diagnosis, the profession is greatly indebted for whatever light has already been shed on this, the most obscure, insidious and baffling of all the complications of the middle ear suppuration.

I intend avoiding more than a casual reference to the immense literature of this subject. Mostly recent, it is easily available, and I forbear the time and space which a thoroughly critical review of this side of the subject would entail. Personal observation necessarily must be of more interest, and in the hope of eliciting the experience of others with labyrinthitis, I present the present status of labyrinthine surgery from the personal standpoint.

To appreciate the basis of my remarks and comments, a very brief summary of my cases becomes necessary.

Cases.

Case I. Female, 27 years of age, came under observation (Manhattan Eye & Ear Hospital) August 1906 suffering with an acute exacerbation of a chronic middle ear suppuration. Radical operation performed August 20, 1906.

August 22, 1906, Nausea, vomiting and rise of temperature, besides a *feeling as if falling forwards*, accompanied by dizziness, are noted.

August 23. General condition better, but nervous irritibility increased.

August 25. *Horizontal Nystagmus* when eyes are turned toward healthy side, and later in the day, in addition, vertical nystagmus P. 90, R. 22, T. 100.

Immediate exploratory operation. No fistula found(no erosion on semicircular found.

At tip of petrosal pyramid, pus located communicating with an intradural abscess.

Patient grew rapidly worse and died 3½ hours after exploratory operation.

Note: *Although there were symptoms from labyrinth, no external evidence on labyrinth wall was present to demonstrate that this was diseased.*

Case II. J. M. one year of age, came under observation at the Manhattan Eye & Ear Hospital, March 27, 1907. Has *otorrhoea of months duration. Facial paralysis came on simultaneously with the otorrhoea.* Patient brought in semi-comatose. Immediate radical mastoid operation, among the findings of which were necrosis of the dura; posterior bony meatal well destroyed. The proximal end of the facial was not to be found. The distal end located embedded in granulation. *Horizontal semicircular canal* necrosed, and its lumen open (fistula).

April 2. Muscular spasm.

April 4. Vomiting, muscular spasm, *nystagmus* appeared.

April 6. Symptoms of meninigitis clearly defined.

April 11. Death.

Note: *The patient's general condition did not warrant a second surgical procedure.*

Case III. N. P. 1½ years of age came under observation at the Manhattan Eye and Ear Hospital, April 16, 1907 having a purulent otorrhoea for one year. Fever had been present for three days. Radical mastoid operation April 18, 1907. Among the findings were *eroded horizontal semicircular canal.*

The child was normal from April 19th to 23rd, when a Panse flap was cut. The next day, after the flap operation (April 24, 1907) temperature rose to 100.6, P. 150, R. 52, and *facial paralysis became evident.*

April 26. Child gradually became normal, and continued so until discharged from hospital showing nothing unusual in its post-operative condition except the facial paralysis which was complete (May 2, 1907.)

May 11. Patient was brought in with T. 103, R. 28, P. 28, in a semi-conscious condition. Immediate exploratory operation on labyrinth was performed. The stapes was found imbedded in granulations, and *when manipulated evoked no nystagmus.* The entire labyrinth was opened and pus was found in all the internal ear chanels. Lumbar puncture at the time of operation gave cloudy fluid.

From May 12th to May 18th, gradually grew worse until death intervened.

Note: *No finding at the primary operation to direct suspicion to labyrinth.*

Case IV. F. S. aged 15 months came under my observation at the Manhattan Eye & Ear Hospital suffering from *acute purulent otitis media involving both ears.* Immediate paracentesis.

June 10, 1907. The condition necessitated double simple mastoidectomy which was performed on June 13, 1907. Case was uneventful, makin unusual progress and was sent to O. P. D.

During the night of August 10-11, the child *awoke with a sudden attack of vomiting, accompanied with sudden facial paralysis* on the right side, and was admitted to hospital the following morning with T. 103, R. 28, P. 130. Facial paralysis and otorrhoea on right side. Muscular twitching noticed in hands and arms. Pupils dilated, head drawn back, some convulsions immediately before operation.

Among the operative findings at the exploratory operation was, *staples imbedded in granulations with perforated annular ligament.* The labyrinth was opened completely (canals, vestibule, and cochlea.) Facial nerve exposed.

Pressure on the jugular during the operation caused increased flow of fluids in the labyrinthine spaces.

August 13, 1907. Difference in size of pupils, the right larger than left and patient died that day.

Note: Promptly opened labyrinth which, however, proved unavailing. Increased flow of fluid when jugular as pressed upon, showing no protective barriers had been erected between local invasion and cranium.

Case V. Male 38 years of age came under observation at the N. Y. Nose, Throat and Lung Hospital December 31, 1908 suffering from a fulminating type of acute mastoiditis necessitating immediate operation.

Simple mastoidectomy was performed upon a very pneumatic mastoid process, no unusual findings being noted at the operation.

Jan. 1, 1909, vomiting, pain in head and ear and *slight horizontal and oblique nystagmus not toward healthy side.* On the afternoon of the second day, patient had a chill, temperature rose to about 103, R. 28, P. 112. The temperature ranged from 102 to 103, R. 28, P. 112 to 120 until Jan. 4, 1909. *Meanwhile nystagmus had ceased, but sensation of dizziness continued.* There was little or no vomiting, *but meningeal signs became apparent* and on Jan. 4, 1909 *exploratory operation was undertaken.* Among the findings we note that the *horizontal semicircular canal* was found eroded.

The pus from the mastoid process gave pneumococcus, as did also the lumbar puncture fluid.

Meningitis developed and patient died Jan. 13, 1909.

Note: Operative proceedings were very limited upon the labyrinth, the eroded canal received attention only, because after the removal of the necrotic area nothing further abnormal was to be found.

Case VI. Patient, male about 30 years appeared at the Manhattan Eye & Ear Hospital Feb. 26, 1910 with a fuly developed mastoiditis in an ear which had been operated upon for acute mastoiditis many years previously. Simple mastoidectomy was performed, evacuating in addition to the mastoid contents, a subperiosteal, a peri- sinus, and an epidural abscess. Noteworthy was the finding that this combined abscess-formation was completely shut off from the aditus ad antrum and the antrum by a place of smooth hard bone, extending from the tegmen to the mastoid tip. The tip was found perforated through the diagastric fossa, and the abscess in the neck muscles was evacuated.

March 2, slight *facial paralysis became evident* (4 days after operation.)

March 10. The wound was converted into a radical mastoid aperation. The posterior bony meatal wall was found to be necrotic, and this came away in one piece. A *fistula* was found leading into the horizontal semi-curcular canal. *It was not curretted.* Panse flap and suture, and uneventful recovery.

Note: Only symptom was a partial facial paralysis.

Case VII. Young adult, 27, years, presenting symptoms of acute mastoiditis, was operated upon at the N. Y. Red Cross Hospital, June 1, 1910. Simple mastoidectomy. The mastoid process was found to be partly sclerotic and partly broken down. Dura of middle cranial fossa exposed by disease, and also an area in the lateral sinus wall, far down near where is crosses under the meatal wall to enter the bulb.

Recovery was uneventful, except for the continuation of the otorrhoea, the middle ear never being dry. The post-auricular wound gradually healed, presenting at the time the patient left for home a rather broad sinus leading to the antrum. When this was washed through with medicinal solution, if the temperature was not carefully looked after, the patient underwent spells of *dizziness and normally elicited nystagmus.*

On August 29, 1910 he returned to me, presenting a depressed scar behind the ear, in the anterior part of which a small fistula was found leading toward the antrum. From this pus flowed freely, and he also presented a profuse otorrhoea.

The patient had intense headache, considerable nausea, but no rise in temperature. *Caloric reaction absolutely negative. Deafness marked*, although exact fork tests were not made. Immediate radical operation was undertaken. Among the findings, pus was demonstrable in the canals of the bony meatal wall. No fistula was found in labyrinthin capsule at any place. Panse flap and suture of wound.

Aug. 31, 1910. T. 103+, R. 20, P. 88. This gradually dropped to normal on September 3, 1910.

Sept. 1, 1910. *Spontaneous nystagmus* toward the diseased ear noted. This was more marked when lying on diseased side. Dizziness was complained of, also more marked when lying on the diseased side.

These symptoms gradually subsided until on Sept. 4, 1910, they disappeared, since when patient has steadily improved.

Sept. 18th. The fork tests showed lateralization toward diseased ear, but only the C^4 fork heard per air conduction

Note: This patient was treated by absolute rest in darkened room for three weeks.

In addition to these cases, I have had quite a number of others which presented all, or a certain proportion of the clinical signs of labyrinthitis, but in whom, when on the operating table, I was unable to demonstrate the slightest lesion in the outer capsule of the labyrinth. All of these cases recovered completely after the performance of the radical mastoid operation only. I omit reporting such cases in detail because sufficient substantiation of this operation is found in the literature.

Laboratory Findings No Index to Character of Disease.

The pathological investigation of this lesion presents only one aspect to the observer. This, in a way, accounts for the unsettled status of the entire subject of labyrinthine disease. In vasion of the internal ear channels are either wholly or partially filled with purulent inflammatory exudate. This is associated with varying degrees of destructive inflammation of the membranous labyrinth. According to the stage of the disease when under examination, the findings will very from simple hemorrhagic infiltrate, to complete flooding of the integral parts with pus; or, the advancing evidence of caries or necrosis of the osseous structure is presented, in addition to these findings.

The microscope delivers the same sort of evidence, whether the purulent exudate in the internal ear is produced by an acute middle ear or a chronic middle ear suppuration unless the given case is chronic labyrinthitis per se.

It is therefore easy to understand the divergence in results obtained by surgeons who, although, apparently dealing with identical conditions when considered from the laboratory standpoints, are often handling totally different infections from the clinical standpoint. The laboratory, in this instance, can give no idea of the virulence of the infection, nor the serological condition of the patient invaded. With these factors in mind, it seems advisable to re-arrange our classification of the infectious labyrinthine invasions into the following groups, for differing operative indications will be found applicable to each group.

Classification of Labyrinthitis.

1. *Infectious Labyrinthitis* as sequela of acute middle ear disease.
2. *Infectious Labyrinthitis* as sequela of acute exacerbation of chronic middle ear disease.
3. *Traumatic Labyrinthitis* (Hemorrhagic and infectious.)
4. *Infectious Labyrinthitis* following chronic middle ear disease (without acute exacerbation.)
5. *Chronic Labyrinthitis.*

For purposes of subsequent discussion groups 1 and 2 and 4 and 5 are considered together.

To understand the present status of labyrinthine surgery, a brief discussion of the symptom-complex and the indications for operation within the groups is in order.

Symptoms.

Infectious labyrinthitis following the acute middle ear disease, and to a slightly modified degree, those following the acute exacerbations of chronic middle ear disease, runs a typically characteristic coruse. In my cases its onset was unusally very sudden, after the expiration of a varying interval of time following the primary operation or lesion in the middle ear. The onset is found to be marked with a distinct rise of temperature and *the sudden appearance of facial paralysis.* This controverts the opinion of Dench[5] who does hold facial paralysis an early or common sign of purulent labyrinthitis. The course of the disease is rapid, and one has hardly time to note the symptomatology significant of the labyrinthine lesion, before the predominating signs of meningeal involvement supervene, and obscure the clinical picture.

Whether the labyrinth was opened or not, in my cases at least, surgical intervention was unavailing in all those distinctly the sequelae of acute otitis media. All died. In this connection it is interesting to read Scheibe's [6] report that as many cases die as recover, irrespective of operation.

At first I ascribed the deaths as due to the poorer resistance which was offered by the children (my first few cases happening among children) but the other fatal case in this group (Case V.) occurring in a young adult of the working classes, previously always in good health, contradicted this idea.

A priori, it seems that these cases present data which justify a simultaneous surgical intervention upon the labyrinth at the time of the primary operation upon the middle ear. Yet in the light of experience with cases among children and adults, — especially the former — with facial paralysis, high temperature and even symptoms of meningeal irritation, all have been found to subside after either simple or radical mastoid surgery (a not uncommon observation)—are we perpared immediately to exenterate the labyrinthine channels upon the meagre data thus far on hand?

Answered affirmatively, we will find ourselves very often needlessly opening into the labyrinth with consequent total loss of a functionating ear. For the present at least my view-point is, that these cases should be treated *palliatively*, opening into the labyrinth only when definite signs of its involvement are at hand, and the loss of the fewer number of cases, for a great many of this minority of all the cases with meningeal signs will die — is compensated for by the safety of the many who will recover with a functionally active hearing apparatus under conservative treatment.

I may add in passing another observation. The study of the operative findings in the cases which evidenced distinct lesions—erosions of the semi-circular canal, open labyrinthine window, etc,— at the secondary operation, where no such lesion was apparent at the primary operation, and where the outer labyrinthine capsule was certainly not under pressure of pus during the interval (the first operation laying the wall free), these cases demonstrate that the opening leading into the labyrinth found at the second procedure is not evidence that the pus worked itself inward to the internal ear channels from the tympanic spaces, but that it was evacuated from the labyrinthine interior in the usual effort of Nature to rid itself of pus. This observation substantiates a conclusion of Richards[2] who finds that the outer labyrinthine wall will rupture sooner than the mesial one, given a purulent involvement of the labyrinth. The openings thus found at the second operation are to be regarded as points of eruption rather than gates of entry for purulent matter into the labyrinth.

In Case IV we note that, during the performance of the operation on the labyrinth, after it was laid open, pressure exerted on the jugular produced an increased flow of labyrinthine fluids from the opened structures. This I interpret to mean that no obstructive barrier has been erected between the lymph and venous channels and those communicating with internal ear spaces. The rapid and virulent advance of the infection in the first 24 hours following after the first significant symptom, the way was still apparently open toward the cranium. In itself this characterizes the acute cases of labyrinthine infections. When we consider that the labyrinth is actually only a lymph channel, which through the development of the temporal bone happens to be encased in bony walls, and incidently only carries within itself the delicate end-organs of special nerves, then we must realize that its infectious invasion simulates the characteristic reactions of any other lymph channel in the body, and its inoculation by septic matter means rapid spread. The frequent implication of the jugular is a sign of this rapid spread of infection, as Richards has pointed out, when we consider the vascular connection between the veins of the vestibule, the semi-circulars and the lateral sinus, and those of the cochlea and the inferior petrosal sinus. Therefore, surgical intervention must be most prompt and distinctly wide in scope if we hope to eradicate the infection.

The present status of our knowledge, gives us no satisfactory indication to meet these requirements in time to avert the meningeal invasion, which once established, usually leads towards a fatal outcome.

The existence of difference between the purulent invasion of the labyrinth as a sequala of acute and those following chronic middle ear cases is just beginning to receive some recognition abroad. Thus we find Jansen[4] stating that with acute otitis every vestibular disease is severe and dangerous, and every fistula in semicircular canal is to be regarded as a sign of a present or imminent malady of the entire vestibular apparatus. Bárány, Hinsberg and Scheibe[6] are of the impression that acute purulent labyrinthitis in acute ear cases more rapidly leads to meningitis than even the acute infections following chronic middle ear suppurations. Wanner[7] and Ruttin,[6] also make distinctions between the two conditions, while Neumann,[6] on the other hand, from his pathological studies, is disinclined to accept the existence of the differences.

Diagnosis of Acute Labyrinthitis.

What means have we for diagnosing acute purulent labyrinthitis following acute infections of the middle ear spaces.

My cases, as well as a large proportion of those recorded in the literature, never gave any sign characteristic of the class of case under discussion until meningitis is present.

Fever, headache, nausea and vomiting constitute no significant symptoms. The special signs from the labyrinth, such as tinitus are rare, and cannot be obtained at all from children. The estimation of impaired hearing also presents difficulties because of the condition of the patient's faculties after the onset of labyrinthine infection, nor is it in any way characteristic of the lesion.

It is conceded that tuning fork tests are of doubtful value. (L. Page[10]). In children totally useless, in adults who are still in possession of their faculties the following is found: bone condition is usually impaired, and range of audition greatly reduced; the upper tone limit lowered, and the lower tone limit elevated. Richards[2] also found the fork tests of no value. In themselves these findings are not significant.

On the other hand, if deafness develop under our eye, if we witness the sudden change in lateralization, and the gradual lifting of the lower tone limit and the descent of the upper tone limit, in conjunction with loss of hearing for language, then, and only then, will the estimation of impaired hearing have any significance.

The estimation of disturbance of equilibrium is subjected to the same general criticism as applies to the hearing tests. It is not significant of labyrinthine trouble.

Spontaneous Nystagmus.

Spontaneous nystagmus seems the only significant symptom, and it too often comes on too late to be utilized as a factor of surgical moment. In four of my cases it was present. In one it appeared seven days after onset, in another five days, in the third case it appeared on the second day and in the other it presented itself four days after the first operation.

Shall the appearance of spontaneous nystagmus be our guide to operation? Bárány says that if spontaneous nystagmus under-goes rapid decline it points to the labyrinth. If it persists unchanged for several days it points to cerebellar disease. If it remains unchanged but strongly marked for 24 hours it originates probably in an endocranial abscess. My cases do not bear out this interpretation. McKenzie[12], in discussion at the Otological Section of the British Medical Association, warned against relying on the evidence of sponataneous nystagmus for diagnostic purposes. Like vertigo, he considers it a danger signal only, and we know that like vertigo it may be provoked by many other conditions besides labyrinthine involvement.

Nor can the direction of the spontaneous nystagmus be made of diagnostic import. In my cases its direction varied individually and McKenzie's[12] studies likewise demonstrated variability in the direction of the spontaneous nystagmus in the same class of cases.

By examination, we can test co-ordination (V. Stein) and we also have the vestibular tests of Bárány. The former are almost impracticable of application, and the value of the latter is a debatable subject in the type of cases we are discussing.

Caloric Reaction.

Since the introduction of the Bárány caloric reaction something has been accomplished toward diagnosis of labyrinthitis. The test is simple in application, it supercedes the rotation tests and is fairly accurate in its significance. But in the acute infectious labyrinthine diseases it has many disadvantages which must give us thought.

Bárány[9] recently stated that the vestibular tests are not sufficiently delicate to enable us to diagnose trifling diseases in the labryinth; nor do they at any time, for that matter, enable us to determine what kind of pathologic changes are being enacted within the labryinth. The test then fails when most needed to give timely warning that surgical intervention in indicated. Jansen[4] holds that the caloric reaction has often *not* disappeared at the precise time when the surgeon would have the most favorable situation in which to operate.

Furthermore the caloric reaction is of no value in cases where vertigo is pronounced and when it is only present when patient is turned toward the diseased side. (Jansen[1]) In Case VII. of my series this was the finding. The caloric reaction was absolutely absent, yet the patient made a full recovery without operation. Jansen, additionally, reports that the inflammation may reach the brain before loss of vestibular function is manifest. Comparing his observations at the operating table and those from autopsy, in cases both with positive (i.e. elicited nystagmus) and with negative (loss of functional activity) he believes that only the negative finding has value. For he found with a "well conserved reaction"—to use his own words—cases of severe inflammatory alterations in both vestibule and semicircular canals which often led to fatal meningitis.

Finally as Lermoyez and Hautant[11] have shown, the caloric reaction only gives information regarding the functional activity of the posterior labyrinth exclusively.

Dangers of Caloric Test.

Finally not only is the caloric test of doubtful diagnostic value, but its performance, in the acute type of cases we are discussing, entails certain dangers. I have therefore not tried it on my cases except in Case VII, and here only before I really comprehended the patient's condition. My reasons for this attitude are based upon observations which Richards and others have made, and substantiation through my own findings to which I have already referred when discussing fistulae and erosion on the outer capsular wall of the labyrinth, as being evidence of efforts at evacuation of purulent products from within the labyrinth outward, rather than signs of inroads of pus toward the endocranium. To syringe even sterile water into the middle ear as must be done, (because the tympanic cavity is laid open by virtue of the radical operation) naturally creates back pressure on the pus contained in the labyrinth channels, and to any one who has taken the trouble to examine specimens of circumscribed labyrinthitis, under the microscope, the delicacy of the protecting barriers, which nature throws around the labyrinthine, invasion must be evident. It requires but little additional force to break these up, and thus disseminate the infection, and change what we hoped might turn out to be a localized lesion into one which will be diffuse.

Scheibe[6] likewise finds reasons to omit using the caloric tests, believing them distributors of infection within the middle ear channels in this class of cases. Aside from the possibility of causing part of the water to penetrate the labyrinth through a possibly open labyrinthine fenestrum, he helds that the movements of the intra-labyrinthine fluids which, according to Bárány and others, is necessarily provoked by the tests, that these movements are not to be considered indifferently. Finally Jansen[4] states his belief that "syringing" (caloric testing) should be avoided as long as we hope for a favorable or spontaneous cure of the case.

From all the above, it follows that absolute diagnosis or even probable diagnosis with the present means at our command, is impossible before exploratory operation, and secondary exploratory operation is justifiable only when the entire clinical aspect of the case is studied, and when this warns us that meningeal invasion is threatening. *Until the signs of meningeal irritation supervene, that is, signs of irritability from the arachnoid membrane, we have no indication for exploration of the labyrinth.* This conservative attitude has the endorsement of the clinical experience of Uffenorde,[14] Marx,[15] Gradenigo,[16] Scheibe,[6] Panse,[6] Schwartz[6] and others. Hinsberg[6] in fact adds that he believes the opening of the labyrinth in acute labyrinthine invasions in the course of acute otitic cases, a short time after rupture, to be a measure in itself not devoid of danger; and, Bárány too believes that in the absence of danger signs a certain time might be allowed to elapse before operating in analogy with the late operations in appendicitis.

Given a case with suspicious symptoms, after acute mastoiditis or following an acute exacerbation of chronic purulent otitis, of what shall our treatment consist? I believe that Scheibe[6] has found the rational answer. The therapy consists in absolute rest, after the eradication of the primary foci in the middle ear spaces. He employed this method in four cases. The patients were kept almost immovable in bed for almost three weeks. He had one fatal termination, and in this case absolute bed rest was not enforced. He reports, that in comparison with these uniformly good results, his results, when he still treated labyrinthine suppurations as ambulatory cases, were a uniformly fatal termination. Since all my previous cases with marked symptoms had died whether operated on or not, I tried this method in Case VII, and can report my first recovery where labyrinthitis was distinctly diagnosed in the course of an acute middle ear infection. During the rest period, the patient must be faithfully watched for meningeal symptoms, at the first sign of which operative intervention is urgently demanded. Then prompt, radical surgical measures become the order of the day. Any hesitancy on the part of the surgeon, or incompleteness in technique not only affords no advantage but usually does harm; for as Urbanschitsch[13] remarks, although the unfavorable course of meningitis cannot be arrested in the majority of the cases, nevertheless the timely operation on the labyrinth may prove successful even in the presence of meningitis so far advanced as to give turbid or purulent fluid upon spinal puncture.

Surgery of Acute Labyrinthitis.

Regarding the surgery of this type of case, it is to be remembered that none of all the advocated surgical procedures completely meets the surgical requirements of the lesion. It is not possible to reach those cases where infection is present in the intricate cellular system at the pyramidal tip. Such cases cannot be controlled by operation according to Winckler[6] and others. Laurant[17] also acknowledges the impossibility of obtaining complete elimination of pus foci. Time, in performing the various technical procedures, is an unfavorable factor, and it takes time and care to do the advocated procedures to totally expose the various semicircular canals combined with an extensive vestibulotomy and full exposure of the cochlear whorl.

The simplest procedure, and in my opinion the quickest performed, and the only one which meets all the surgical indications in these acute cases, *is the total ablation of the petrosal pyramid* with its contained labyrinth. This presents certain distinct advantages. The advantages reside therein that it eradicates the entire mass of infected cellular elements at the tip, including the entire labyrinth. It drains the posterior cranial fossa (the usual site of first infection of the endocranium) at its most naturally placed drainage point—at the location of the internal auditory meatus. The middle cranial dura is likewise rendered accessible. On the other hand, the dura is attached closely to the pyramidal tip, and conceivably might be torn in removing the bone. The petrosal sinuses are also liable to injury, but both these disadvantages very often obtain during the performance of the Jansen-Neumann method of the labyrinthine operation. Finally, the proposed procedure entirely sacrifices the facial nerve.

I regard the class of cases in which the total extirpation of the petrosal pyramid would be indicated as most desperate, and it hardly seems to me to be a correct surgical attitude to permit a nerve (even as important a nerve as the facial) to stand in the way of total removal of accessible portions of the diseased ear.

Whether or not the profession is ready to take this stand in regard to sacrificing the facial, in the face of these desperate cases, I do not know. Gradenigo[16] only has even touched on this side of the subject, but I firmly believe that in the face of almost universal fatal outcome of these acute cases of purulent labyrinthitis that the preservation of the facial nerve should not enter into consideration, and it is the conservation of the contiguity of this nerve which makes the various advocated labyrinthine operations difficult in technique, and slow in their performance.

In conclusion, I may add that there are two absolutely indespensible conditions for success in labyrinthine surgery, no matter which procedure is elected, and these are that the labyrinthine interior must be made as accessible as possible to the surgeon, and he must thoroughly understand the surgical topography of these regions.

Traumatic Labyrinthitis Purulenta.

Under the heading of traumatic labyrinthitis, I group those lesions of the labyrinth which are the result of accidental injury either extraneous or of surgical origin.* The condition is rather rare from both sources. The protected position of the internal ear accounts for the rarity in the first instance, and a better understanding of the surgical technique of the radical mastoid operation mitigates the frequency of injury in the second instance. The horizontal semicircular canal is most frequently the location of the lesion. (Jansen[4]). The next most usual site is the accidental lesion the stapes which is dislocated. The latter constitutes the more serious of the two injuries. I do not consider the accidental opening of the horizontal canal as possessing great factors of danger. The small size of its lumen and its readiness to occlusion in the face of inflammatory reaction soon places protecting barriers against the further propagation of infection. Furthermore the absence of any communication between the semicircular canals and the cranium are likewise factors of safety.

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*The term "Post-Operative Labyrinthitis" of Jansen, Alexander, Hinsburg, and others is misleading. What they refer to, is really a latent labyrinthitis observed in connection with chronic middle ear disease which becomes manifest after Radical Mastoid Surgery.

When luxation of the stapes takes place, the immediate access which it permits to the vestibule constitutes its danger. However, many cases are recorded which never progressed toward a general labyrinthine infection. When infection does supervene, its onset is sudden. Within a day, according to Jansen—half a day, symptoms appear which are mostly unappreciated as to their significance because the patient is still battling with the after effects of necrosis (Mygind[19]). The onset is manifested by vertigo, disturbance of equilibrium and nystagmus, and occasionally by a subjective sensation of tinitus. By a careful observation of the case, the rise in temperature, headache, and the above mentioned symptoms make the diagnosis clear.

The *differential diagnosis* between traumatic infectious labyrinthitis and labyrinthine irritation cannot be definitely made except by a consideration of the case as a whole. We interpret continued rise of pulse and temperature as significant of arachnoidal reaction, and its presence clears the diagnosis.

The infected cases naturally simulate the condition which I have described under the discussion of acute infectious labyrinthitis following acute middle ear disease, except in so far as we know the route of invasion in the traumatic cases.

In dealing with this condition, *prophylactic measures* are better than cure. It is a good practice, when performing the radical mastoid operation, to have the anaesthetist not only watch the face for twitches from the facial during the removal of the posterior-bony meatal wall, but also *to watch the eyes for signs of elicited nystagmus* during the removal of the two greater ossicles, and during the cleansing of the tympanic cavity. The slightest touch on the stapes will evidence itself by nystagmus, and will warn the surgeon in time. Likewise when performing the radical operation, if areas of the outer labyrinthine capsule look suspicious, or superficial erosions are noted on the arches of the semicircular or upon the promonotory, or when granulations are crowded about the oval window, do not remove them, they are as much protection barriers here, as are the granulations situated upon the uncovered sinus in cases of perisinus abscess. Gradenigo even considers it dangerous to remove cicatricial tissue from the labyrinthine walls.

Treatment.

Given a suspected case of traumatic injury, at once remove all dressings, and inspect the labyrinthine capsule. Then wait and keep patient absolutely at rest. Operative intervention becomes indicated as soon as symptoms of labyrinthine infection are marked, persistent or on the increase. Jansen believes in early operation on these infected cases, because from his observations at autopsy compared with those at operation on similar cases, he finds that the operative procedures do not hasten death. Because only two of his cases showed spontaneous cure, he believes it is better to open the infected part than to wait for labyrinthine symptoms to increase or diminish. When we operate early a favorable outcome is to be anticipated.

When operating on these cases, the opened labyrinth should not be curretted so as not to detach any adhesions which may have formed with the meninges. (Boenninghaus[21]).

Labyrinthitis Chronica.

The continued presence of chronic middle ear suppuration, if permitted to run its course unchecked, eventually, in a certain proportion of cases, invades the labyrinthine channels. The primary site of penetration toward the interior is a matter of controversy, but really it is of little practical importance. Within the labyrinth, the invasion either spreads throughout the internal ear channels, or it becomes localized in a given part. It represents in the majority of cases the connecting link between chronic middle ear suppuration and fatal endocranial complications (Rendu[19]).

Its course is characterized by a period of latency, of varying intervals of time, which sooner or later becomes actively manifest as a purulent infection.

Diagnosis.

The diagnosis of serous labyrinthitis and circumscribed labyrinthitis are both open to question. From both conditions recovery may take place, and the tendency to describe all recovered cases (without operation) as circumscribed lesions is naturally inaccurate, for we have no positive methods of localization, and in the second place, the so-called cured cases of either type rarely come to intelligent autopsy examination. For the present at least, we can designate this type of labyrinthitis under two groups only: (1) Chronic latent labyrinthitis, (2) Chronic manifest labyrinthitis.

Regarding diagnosis, it is to be remarked, that pronounced or well defined signs of labyrinthine suppuration are rarely present except in the cases of sudden invasion or rapid extension. This lesion rarely falls within this compass. Conceivably, when the process or erosion advances slowly, gradual accommodation of the vestibular function to the changed situation ensues, so that manifest symptoms are not always observable. (L. Page). In a large percentage of cases the labyrinth is destroyed without characteristic symptoms.

The latent period in these cases is the most difficult not only to diagnose, but it also presents difficulties for the formulation of operative indications. According to Rendu[19] the disease is most frequently expressed by paralysis of the vestibulo-cochlear nerve, *i. e.*, deafness for air and bone conduction, loss of vestibular reaction to rotatory and caloric tests. *The most valuable data for diagnostic purposes are obtained from careful functional tests, the history of the case, and the study of the symptoms accompanying the chronic otitis.*

Transient attacks of dizziness and vertigo are suspicious, the operative findings at the radical mastoid operation, presence of fistula—all give presumptive evidence toward labyrinthine disease. Schmiegelow[20] opens the labyrinth in these cases, when one or more fistulae are present. He does not operate on the labyrinth when it presents isolated fistula in the semicircular canal and the hearing is good.

When functional examination points toward labyrinthine disease, but the findings at the radical operation are negative—no fistula—and semicircular canals are not even darkened, it is advisable to wait an interval before operating, for while labyrinthitis may be present, it may already be on the road toward encapsulation (Boenninghaus). When there are merely signs of labyrinthine irritation at the time of the operation on the middle ear, neither necrosis nor orifices being discernible, the opening of the labyrinth is not indicated. In this case, as well as in those where erosions are present, with or without labyrinthine symptoms, it is a good rule to keep the patient under observation for some time.

Laurant[17] believes in curretting and disinfecting the local erosion or fistula, Grandenigo strongly takes the opposite view, and Politizer goes even further in warning against the removal of granulations about a fistulous opening. MacCuen Smith[22]holds that a large majority of the fatal cases have occurred as the result of meddlesome surgery which disturbed the protective barriers erected to prevent infection being carried to the meninges and the interior of the skull. West and Scott[23] operate in all cases wherein the vestibule and the ampullary extremities of the canal are in volved. In fistula or necrosis of the external bend of the outer canal, and in the absence of all labyrinthine symptoms, they hold that the operator may limit himself to a simple currettage. When the promontory or cochlea is found perforated, the diseased bone should be removed. In lesions of the semicircular canals, Richards limits operative procedures to carious areas found.

The recommendation of expectant measures in circumscribed affections of the semicircular canals is based on the assumption expressed by Hinsberg, Jansen[4], Bezold, Bourguet[28] and others that this form of labyrinthitis frequently heals together with the middle ear and very rarely becomes the starting point for fatal complications.

The *contra indications* for the operative opening of the labyrinth are essentially based upon the fact—shown by pathologic anatomy and clinical experience—that in a certain proportion of labyrinthine suppurations which are limited to segments of the labyrinth—protective adhesions form and prevent the propagation of the infection, thus permitting spontaneous healing. Interference is therefore unnecessary and even dangerous in these cases. The complete and rapid removal of the cause of the inflammation is all that is indicated (Gradenigo).

Let us now consider cases where there are marked symptoms suggesting labyrinthine involvement. My views coincide with those of Jansen, Hinsberg and others, that these symptoms often all disappear with the performance of the radical mastoid operation. Of 190 cases which Jansen considered as being "decidedly labyrinthitis" there were only ten which proved fatal. In all of the 190 cases radical mastoidectomy only was performed. From this he believes that we have acquired evidence at least regarding the vestibular portion of the labyrinth, that a great number of cases do not end fatally, nor in chronic ailment, but effect a spontaneous cure. In his opinion there is not the slightest doubt that in the majority of these cases, disease of the entire vestibular portion of the labyrinth has been present, even though single or numerous instances of it may be regarded as a circumscribed disease of the semicircular canal.* On the other hand, operation should be undertaken upon the labyrinth at the first definite sign of the progression of the lesion, and this must be determined by careful observation of the

*The suppurative affections of the labyrinth which heal spontaneously include: (1) cases of labyrinth suppuration occurring in the course of a purulent cerebro-spinal meningitis, the middle ear remaining intact; (2) otitic purulent labyrinthitis in which an abscess forms in the labyrinth as the result of suppuration of the membranous labyrinth whereas the bony labyrinth and the petrosal bone are not involved in the inflammation; (3) cases of purulent labyrinthitis in which the bony lateral wall of the labyrinth is first affected by way of the middle ear, and the pus at last ruptures into the labyrinth through a fistula, the remainder of the labyrinth remaining normal. Needless to say that recovery takes place at the expense of the nerve end organ terminals. (Deafness and total loss of irritability of vestibular and semi-circular apparatus in the majority of cases). In the minority of cases, a remnant of hearing and a positive reaction to irritation of the semi-circular and vestibular apparatus are left behind (Alexander) (25).

patient, studious estimation of the various functional tests, and the operative findings at the primary operation. When hearing is markedly impaired, caloric reaction is negative, if fever, vertigo and headache are present it is safer to operate than not to operate.

Summarizing the Indications for Operations on the Labyrinth.

We contend:

1. That the indications for opening the labyrinth in acute infectious labyrinthitis following acute middle ear suppurations, and following acute exacerbations of chronic middle ear suppurations is still a debatable question. If operation is elected, then it must be extremely extensive in area, and promptly follow the first sign of meningeal irritation. That in this class of cases no reliance should be placed upon data from functional examination.

2. When labyrinthine suppuration appears as the sequala of chronic middle ear suppurations, or cholesteatoma, without demonstrable disease of the labyrinth, then operation may be limited to the middle ear spaces, a retrogression of the labyrinthine symptoms being within the range of possibility. Fistulae of the semicirculars, and erosions of the promontory, in cases with intact hearing, do not require operative intervention. When symptoms of labyrinthine involvement appear in the course of suppurative middle ear disease, or after operations on the middle ear, without fever, and without signs of meningeal irritation, then an exact functional examination to determine the activity of the labyrinth is first demanded. If found functionally active, but of less intensity in reaction, no immediate labyrinthine operation is necessary although surgery may become a necessity at a subsequent period. If function is totally lost, then prompt operation on the labyrinth opening is extensively indicated to guard against meningitis.

Remarks on Technique.

The many operations which have been published and advocated by various authorities, are evidence in themselves that no one given method of procedure meets the surgical requirements of purulent labyrinthitis.

The situation should be met by individualization necessitated by the conditions found in the given case.

I do not intend detailing the various operative procedures advocated from so many different sides. They really differ more in regards to technical details than regarding fundamentals. Personally, I prefer the Richard's operation[2], and when I have my choice, that procedure is employed in my cases.

In the interest of completeness I will add the following remarks on technical points.

The Richard's operation starts by entering the labyrinth behind the facial ridge. The semicirculars are thus opened from behind, the facial nerve is conserved, then the vestibule and finally the cochlea is opened. The posterior cranial fossa is not opened as a step in the labyrinth surgery.

The Jansen-Neumann method opens the posterior cranial fossa as part of the procedure on the labyrinth. It guarantees the complete suppression of deep seated diseased bone segments from which endocranial complications may start. Furthermore it permits an easy exploration of the posterior and middle cranial fossae. This operation is very radical, dura is exposed to a great extent, and this very exposure interferes with the progress of the operation by producing sagging into the wound during the operation and during the after treatment. Rendu[19] finds it impossible to currette the anterior and inner portions of the labyrinth on this account. Gradenigo holds the Jansen-Neumann method too aggressive. Jansen, however, considers his operation especially adapted to cases where endocranial complications exist, and Neumann thinks it preferable to expose the cranial fossa at once for both diagnostic and operative purposes.

The method of *Hinsberg*[27] and *Botey*[29] are similar. They however reach the vestibule from in front of the facial ridge, then enter the promontory, etc. This method of procedure leaves a blind pocket, a cul-de-sac, at the lower orifice of the semicircular canal, besides greatly endangering the facial nerve. Jansen[7] and Frey[7] regard the procedure as dangerous.

Uffenorde's operation[14] and its modification by Bourguet endangers the facial nerve besides being one of the most complicated technical procedures.

Hautant[30] proceeds in a similar manner to Hinsberg and after the vestibule is opened, the end of the external semicircular canal is exposed. He follows the deeply lying branch of this canal until it reaches the vestibule, thus opening from in front and from below. He then individualizes the subsequent procedures according to the findings at operation. Dura of the posterior cranial fossa is not exposed in the face of the endocranial complications.

The method of Hammerschlag and Frey[31] is particularly fitted for cases where the lateral sinus is situated far back, according to Neumann.

These constitute the most commonly known of the various operations on the labyrinth. With the requisite knowledge of the topographical anatomy and a working technique in any one of these procedures, the varying details of these operations are easily at hand for anyone, and their respective values can be individually established.

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SOME REMARKS ON SINUS THROMBOSIS,

WITH PARTICULAR REFERENCE TO THE DIAGNOSTIC VALUE OF BLOOD CULTURES IN OTITIC DISEASE.

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The intimate topographic relation existing between the vascular sinuses of the cranial cavity and the temporal bone, brings into prominence suppurative diseases of the middle ear and its accessory osseous chambers. An extension of purulent inflammation to these large venous channels is not infrequent and as its symptom-complex is often atypic, great difficulty is encountered in correctly and promptly appreciating the resultant complication. In addition to the superior and inferior petrosal, cavernous and lateral sinuses, the jugular bulb, the internal jugular vein and its tributaries, and the smaller veins of the cranial contents perforating the osseous structures in various directions, all play an essential role in localized infections here and the phlebitis associated with a suppurative otitis whether acute or chronic, depends in large part for its symptomatology, upon the relationship of these structures one with another.

It is, however, in this study with the lateral sinus and particularly its sigmoid portion, that we are especially concerned, as it is in this venous channel that infection by far most frequently takes place from the middle ear and mastoid cells. In every case of mastoiditis, lateral sinus thrombosis always looms up as a possible sequela, and, on account of its relatively high mortality, with the absolute necessity for a serious operation to prevent general pyemia, all factors that will in any way aid in its early recognition should receive the most careful attention. As a result of the varied and irregular conformations of the temporal bone, the location of the signoid sinus also varies greatly; and, I am sure that the development of an infected thrombus at this point bears very closely along anatomical lines, as where the sinus is separated from the mastoid process by a thick, non-cellular posterior and inferior wall there is much less danger of infection than when it is well foreward in relation with the posterior wall of the external auditory canal, and the adjacent tympanic areas are intimately connected with it by means of the abundant vascular supply. By no means is the anatomic location of the signoid sinus fixed and while in operating on the mastoid process, one expects to find the invloved portion of the sinus just posterior to the antrum and about one-half posterior to the posterior wall of the external auditory canal, yet this location is far from constant. And, as I have before stated, there is probably no important portion of the temporal bone which is so uncertain in its location.

In the study of the sinus in relation to infective thrombosis and its recognition by the valuable aid of blood cultures, a clear conception of its location to the antrum which is undoubtedly the remaining focal point of the purulent collection, especially in chronic suppurative otitis media, is most essential. And as has been pointed out before, the distance between the sigmoid sulcus and the antral wall already exceeds five millimeters, so that in operating for the exposure of the sinus, unless there is a direct osseous fistula which of course at once locates its position and its relation to the focus of primary infection, this point must always be kept clearly in mind. In the majority of cases, especially when the mastoid cortex is thick, the osseous tissue is apt to be thin in the region of the digastric fossa. While on the other hand where the mastoid process is small in size, the lateral sinus will often encroach upon the antrum. Again, when the sinus is large and bulbous, it comes in closer contact with the cortex and the posterior canal wall, so that the opportunities for infection are more enchanced in this type of mastoid when the parts are the seat of a purulent infection. In a general way it may be said that the sinus may be placed in either one or two positions relative to the antrum bearing on the development of infection. In one its groove may be unusually deep so that this enlargement of the channel lessens the thickness of the osseous strip of tissue separating it from the antrum, or, the groove may be placed far anteriorly so that the sinus is brought immediately internal to the antrum. Rarely it may even be in front of it, so that the antral space will be narrowed from without inwards and the relationship between the two present a most intimate type.

The great problem of sinus thrombosis to the otologist, is not so much in etiology or in operative technique, but in the early recognition of infection of the sinus and with the usual symptoms as they appear, this is often a most difficult and many times an almost impossible problem; it being in such cases that a study of the blood cultural characteristics in the so-called atypical type of infection presents its greatest value and as will be seen later practically enabling one to decide whether or not a sinus thrombosis is present, or whether some infection elsewhere, is the basis of the presenting symptomotology. Without minimizing the risk of operation in purulent lateral sinus thrombosis, which is considerably enhanced when the extent of the operative field is increased by added jugular involvement, yet in every case the danger increases greatly as each day passes with the affection unrecognised, or the surgeon in the face of variable symptoms that are not chracteristic, hestitates and delays operation.

Undoubtedly the opening of the sinus as an exploratory measure in the presence of a mastoiditis without fairly positive indications, is not to be considered good surgery and warning must be raised against too energetic operation under such circumstances. One should be reasonably sure of sinus involvement before operation for its relief is undertaken. The sinus should not be opened on suspicion, but operation should be performed in either acute, or chronic mastoid disease accompanied by characteristic phlebitic symptoms such as chills, sweats, wide excursions of temperature and pulse rate and especially where the infection is of the streptococcus type and there is a significant differential blood count. Where all or a greater number of these chracteristic symptoms are present no doubt exists that the purulent focus in the sinus should be attacked at once, but unfortunately in many cases, the symptoms are not in any way characteristic in the early stages of its development.

The clinical study of the temperature variations is extremely important, especially in typical cases where a high temperature of a septic type with wide variations should always suggest infection of the large venous channels. A temperature of 105 degrees or more, depending upon the amount of septic material that is being disseminated throughout the general circulation, rapidly followed by a sudden and violent drop to normal or sub-normal within a few hours, is the chracteristic of the typical case. The frequency of these temperature variations depends entirely upon the amount and virulence of the septic material that is escaping from the sinus focus. While there may be but one rise and fall in twenty four hours, yet there may be several such fluctuations during the course of one day. Closely associated with the variations in temperature, yet observed only in a comparatively small percentage of cases, is the occurence of definite chills, severe in type and coming on previous to the rapid rise in temperature. Neither the rise and fall of temperature nor the preceding chill, however, are typical in themselves of a thrombosed sinus, as they occur in all grave septic conditions and simply indicate that a certain amount of infectious material is being distributed throughout the general circulation. Even in the majority of typical cases, however, no such marked chills occur and this symptom might be considered as absent, unless a most careful watch of the patient is kept, when from time to time slight creepy or chilly feelings are complained of. Sweating may or may not follow these apparently minor chills but is usually profuse after a severe chill and high rise of temperature. Especially following the mastoid operation may these chilly sensations be complained of and they are symptoms deserving consideration, particularly if the case is of the typical type.

The pulse rate and respiration in cases unaccompanied with other intracranial complications such as brain abscess, generally keeps pace with the rise in temperature, but this is not in any way characteristic and does not aid one in establishing the diagnosis even in otherwise typical cases. Should nausea or vomiting or both be present and they are frequently absent, they are like the other symptoms enumerated in no way characteristic, but freely indicate that a septic infection of a severe grade is present. In the later stages of a purulent sinuitis with the patient markedly septic, both nausea and vomiting are almost invariably observed and are accompanied with other general symptoms of a septicemia, or pyemia, such as digestive disturbances, loss of appetite, heavily coated and foul tongue, a sallow, dry skin, etc. The eye symptoms afford no indication of the particular lesion present, but the pain over the affected side of the head which is often most severe and even greater than that in an uncomplicated mastoiditis, is highly suggestive; especially so, when there is severe occipital pain or pain along the course of the internal jugular vein.

Locally one may find more or less edema over the mastoid process in the region of the emissary vein. McKernon calls attention to a most important diagnostic sign when sinus thrombosis is suspected after the mastoid operation has been performed, namely, the healthy appearance of the mastoid wound in the early stages of the disease excepting over the bone of the inner table forming the sigmoid groove, which is darker in color over the thrombotic area and granulation tissue has not developed at this point. In cases where the sinus is exposed at the time of the mastoid operation without prior symptoms as a guide, the physical condition of the exposed sinus may be of value in determining its condition, that is, it may be flat, compressible, or lustreless, and the dura over it may be grayish or yellowish in color. But, the physical examination does not always make clear the pathological changes that are taking place within the sinus, as its external walls may present some of these signs and yet its intima coat and lumen be perfectly normal.

It has been considered in many cases that a blood count, especially an increase in the polynuclear percentage to over eighty, indicates the presence of a focus of pus from which the general circulation is being infected. In many typical cases this is essentially correct and such a count is of value in assisting at arriving at a diagnosis. In many cases however, in the experience of every otologist, the blood count is of little or no value in correctly interpreting the condition present as the polynuclear percentage may be high and yet no sinus disease exist, or, the reverse may be the case. Dench clearly estimates this factor when he says that the differential blood count in sinus thrombosis is unsatisfactory, as he has seen a number of cases with a normal count. In one case of thrombosis of the internal jugular vein, with suppuration of the supraclavicular glands of a most severe type, the polynuclear count never rose above eighty per cent. However, it must be borne in mind that the absence of a high polynuclear count does not necessarily mean that there is no clot in the sinus or jugular vein.

A symptom which I have frequently observed in connection with the early development of sinus disease and one which I have never seen described is the occurrence of a unilateral lymphoid pharyngitis or tonsilitis associated with a unilateral adenitis. This adenitis is usually most pronounced beneath the angle of the jaw and at the site of the junction of the facial vein with the internal jugular. The occurrence of a chill and rapid rise in temperature with slight difficulty in swallowing lead to the examination of the throat and, in several instances, the objective findings seemed at the moment to form a basis for the diagnosis of a pharyngeal or tonsillar inflammation as the causative factor of the symptomotology.

As is well recognised by otologists, the early diagnosis of sinus thrombosis and atypical cases at any time during their course, cannot often be made by the symptoms which may, or may not be present and which have been here outlined. As a result of this uncertainty and the desire to combat the affection by surgical measures at an early stage when operation affords the greatest hope of relief and cure of this serious infection, much clinical and laboratory work has been done. As the result of various investigations, especially work done abroad by Leutert, Lenhart, Neurnberg, Kobrak, and Hasslauer, an early and accurate diagnostic sign, that of the study of blood cultures, has been worked out along practical lines. And, the otologist is now in a position to definitely state in the vast majority of cases, whether sinus thrombosis is present or not and thus an opportunity is offered for early operation to remove the purulent focus before the general system becomes the seat of serious pyemic infection.

Leutert states that, during the course of a suppurative otitis, the appearance of great quantities of streptococci in the blood of the lateral sinus confirms the diagnosis of sinus plebitis, especially when other febrile diseases are not present. In order to ascertain the presence of a thrombus in the sinus, he advocates that blood cultures be taken directly therefrom; the significant preponderance of streptococci in the blood of the sinus as compared with that obtained from peripheral venous system, will determine in doubtful cases whether the high fever, which is present in the given case, is to be ascribed to the aural condition, or to some other disease. If there should be a larger number of streptococci in the blood of the sinus, while a smaller number appear simultaneously in the peripheral veins and if other febrile diseases can be excluded, this condition confirms the diagnosis of sinus thrombosis. A negative culture from the blood of the sinus and also from the peripheral veins, does not exclude a sinus thrombosis with certainty. In such cases, he states there may be an isolated thrombus of the jugular bulb and if a deep puncture is not made, a negative culture may be obtained in spite of the presence of a thrombus. In such cases the temperature is a valuable guide in diagnosing the affection, or, one may wait two or three days, and then repeat the puncture in a deeper place, but this delay should be only in fairly acute cases, because he states that in cases of longer duration, the bacteria may greatly diminish in number from the gradual disintegration of the thrombus, when the clinical symptoms will be those of the predominant metastatic foci developed in various portions of the body. In case both sinuses are involved, a septic thrombus is assumed to be present in the one in which streptococci are found either alone, or in preponderating numbers. If the number of colonies is about the same from each side, but that in a peripheral vein markedly less, a bilateral sinus thrombosis is present.

Kobrak in a study of 20 cases of acute otitis media accompanied with a rise of temperature, always obtained negative blood cultures; while in cases of marked severity, positive results were obtained only if the fever was pyemic in character. In eleven positive cultures he found streptococci in the blood seven times and in 28 cases with streptococcic infection of the middle ear there was general infection in seven; while in 17 cases, with local pneumococcic infection, this organism was found in the general circulation in but a single instance.

Neurnberg in his orignal work examined the sinus blood in five cases of thrombosis and found streptococci in each and by this means he was able to differentiate otitic sinus thrombosis from other febrile affections at an early stage before local manifestations developed. In one patient with a high temperature coming on one week after a mastoid operation and evacuation of a brain abscess, six days after childbirth, the question arose as to the cause of the fever, as it might have been due to an incipient mastitis, puerperal fever, meningitis, or sinus thrombosis, but absence of other symptoms seemed to exclude the first three as being present. On account of the negative bacteriologic findings in the blood of the sinus, operation was postponed, but as the symptoms increased in severity, the negative blood cultures were disregarded and preparations were made to open the sinus, when an erysipelatous inflammation developed, thus clearing up the diagnosis. As a sresult of his experience, therefore, he states that negative cultures from the sinus blood should exclude sinus thrombosis, or at least they should justify postponing operation and that the puncture to obtain the blood must be made deep and close to the bulb of the jugular vein, during a period of temperature rise, otherwise the danger of obtaining a negative result, even should a thrombus be present, is very great especially so in case there is an isolated thrombus of the bulb of the internal jugular vein.

From a careful study of the work of these otologists, it becomes very evident that a positive blood culture in the presence of a purulent otitis media, where infection from other sources can be excluded, is indicative of involvement of the lateral sinus by a septic infection. In a study of over 100 cases of mastoiditis which we have made, a negative result from blood cultures was always obtained in uncomplicated cases; while in 50 cases of involvement of the lateral sinus there were 42 positive results from blood cultures prior to operation. In four the first culture was negative but the second culture was positive. As I have stated on a previous occasion, the otologist should not necessarily depend on the laboratory for the diagnosis of a sinus thrombosis, yet a blood culture as a definite part of the examination might be well considered a necessity, such a culture being taken at the time of the mastoid operation. As as result of my experience, this has conclusively demonstrated that mastoid disease per se does not produce a bacteremia. Illustrative are the following cases:

Female, 12 years of age. Complained of pain in the left ear and a slight purulent discharge for two weeks. I saw her in consultation when she was unconscious, with a temperature of 106.5 degrees and an acute mastoiditis with the physical conditions indicative of intracranial involvement. Double Kednig and McEwan signs. Blood culture showed streptococci and immediate operation was advised. The entire mastoid was removed, the sigmoid sinus plate was found necrotic and its removal exposed a contracted sinus which, with the mastoid emissary vein, was thrombosed. There was a fistula in the roof of the antrum and about two drams of greenish pus under great pressure were evacuated. The dura was congested, bluish-black and was bulging; it was incised and the brain was found much congested and friable, with adhesions over a large area. The vertical limb of the sigmoid sinus was then incised and a fresh clot was removed, which was followed by the escape of blood from both ends of the vessel. Blood culture showed four colonies of streptococci to each c.c.; there was a polynuclear count of 90 per cent, and a leucocytosis of 31,000. A blood culture taken two days later was sterile and the patient, after passing through an acute encephalitis, entirely recovered.

Female, 22 years old. This case was one of the first cases of my series and I was rather skeptical of the significance of the laboratory reports. Therefore in the absence of definite clinical evidence of the disease, I was disinclined to operate until such clinical signs were present. Grippe, followed by perforation of the left membrana tympani and four days later it was necessary to incise the right drum membrane. Suddenly high temperature developed with vertigo, nystagmus, nausea, vomiting, and symptoms referable to mastoid involvement. Cerebration was slow; and the tuning fork showed diminished high tones. The left mastoid was opened and the sinus exposed which latter appeared normal. Two days later the right mastoid was operated. The sinus was well forward. There was a leucocytosis of 19,000, temperature 104 degrees, polynuclear 86 per cent. and five colonies of streptococci to the c.c. There was chilliness, restlessness, headache and nausea, and I determined to explore the sinuses. The left was normal, while the right was thickened, striated; on incision there was no free bleeding for some seconds, then followed a free gush of blood as the thrombus was washed out. The temperature was normal for the next three days, yet the blood cultures showed an increase in the colonies of from 5 to 60 per c.c. Then there was a chill, the temperature rose to 103.8 degrees. The right internal jugular vein was excised from the clavicle to the bulb including a chain of enlarged glands. Above the facial vein the jugular was white, flat and densely adherent and streptococci were present in its walls. Three days later a blood culture was sterile and the patient went on to an uneventful recovery.

The value of a positive blood culture in such cases is self evident and on account of the number of atypical cases in which the clinical signs do not allow early definite diagnosis, its value cannot be overestimated. Another factor of value is its aid in determining whether the jugular vein shall be ligated or not after the mastoid has been opened. For, in the presence of a positive blood culture, we have a much more acurate and definite working basis than in the clinical symptoms alone, which are so often atypical and misleading. As an example of this, accept for consideration a case in which the mastoid operation has been performed and evidences of sinus thrombosis develop or which may be present at the time of the primary operation, and the sinus is opened. The blood cultures are found to be positive and remain so even in the absence of signs of jugular involvement. The logical deduction under such circumstances would naturally be that a general systemic invasion is still going on. That this takes place via the jugular vein is reasonable to conclude in view of the constant conversion of positive into negative cultures after a jugular ligation. A case illustrative of this being that of a young man, who, three weeks after a mastoid and sinus operation, had practically a normal temperature and no neck symptoms yet complained of constant frontal and temporal headache. Blood culture showed 230 colonies of streptococci to each c.c. The jugular was ligated and found thrombosed, one portion of the thrombus being well organized, while the other had broken down. The patient made a good recovery. Here the definite diagnosis was established only by the blood culture.

The work of Libman and Celler, (whom I wish to thank for the laboratory aid given me in my cases and for their hearty co-operation in this work), is most valuable and instructive. They found as a result of 163 blood cultures in 100 cases, that positive results were obtained only when the aural condition was complicated either by a meningitis or sinus thrombosis. In the former the pneumococcus and streptococcus mucosus were found in the blood. In an earlier series of 14 cases of thrombosis, cultures were positive in 9, being equal to 64 percent; while in 16 later cases, they were positive in 14 or, 87½ percent, making a total of 30 cases with 23 positive cultures, or 77 percent. In about 100 cases of suppurative otitis media or mastoid disease, without sinus thrombosis or meningitis, the blood culture was sterile in every instance. As stated by Libman and Celler, the early authorities considered the pneumococcus as the most common organism in acute suppurative otitis media; but, more recent investigators find it to be the streptococcus and in their study of 360 cases, the streptococcus pyogenes was found most frequently, the streptococcus mucosus next and the pneumococcus in the smallest number. However it is a significant fact that no case of sinus thrombosis in this series of 50 cases was due to the pneumococcus.

As regards the presence of bacteria in the blood, they were not found in simple otitis media, mastoid disease, extradural abscess, or in brain abscess and positive cultures were obtained only in cases of meningitis or sinus thrombosis. It will be found that the earlier the cultures are taken, the more frequently will positive results be obtained. Still it is possible to obtain negative results even though the clot has disintegrated and passed through the jugular vein to form metastatic foci in various portions of the body. Cases in which the streptococcus was found in the blood after the mastoid had been properly operated upon and in which clinical symptoms still persisted, always presented thrombosis of the sigmoid sinus. In those cases prior to the mastoid operation, where the local evidences are insufficient to account for the temperature and general disturbances, a positive culture would indicate that there is a more serious lesion than would otherwise be suspected, while in another class of cases where the sinus has been exposed and the clot removed, the persistence of streptococci in the blood has been the only indication to ligate the jugular vein. In such cases it will be found that the streptococci disappear from the blood very rapidly following this procedure. In one instance the bacteria disappeared from the blood within four hours after the jugular had been ligated.

The report of Gruening very clearly enunciates the great value of blood cultures. In ten cases of lateral sinus thrombosis the blood taken from the median arm vein before ligation of the internal jugular, was positive in 7 and negative in 3. In all, the same organism present in the blood was also found in the discharge from the ear; 5 being streptococcus pyogenes; 1 streptococcus mucosus and 1 bacillus proteus. The internal jugular vein was ligated in all these cases. While it is true that the diagnosis of sinus thrombosis was made from the clinical symptoms alone and that the blood culture was not necessary expecting for corroboration, yet it was important in showing the relation which sinus thrombosis bears to systemic infection. This relation once established, will assist in a proper appreciation of obscure cases in which clinical data are insufficient for the recognition of thrombosis of the sinus. That a positive culture can be advantageously used as important evidence of the presence of a thrombus, has been repeatedly demonstrated. Patients, who after a thorough mastoid operation do not do well and whose temperature remains high though accessible parts of the sinus appear healthy, improved immediately on ligation of the jugular vein, deemed advisable as the result of continued positive blood cultures. In two cases admitted to the medical ward of Mt. Sinai Hospital with high fever, systemic infection and no recent previous history of ear disease, the diagnosis of sinus thrombosis was made by exclusion of other foci, in the presence of a positive blood culture. In both cases, the lateral sinus was found thrombosed, though with the exception of an old perforation of the drum, there was no evidence of an active ear disease. Both cases recovered after the evacuation of a thrombus from the lateral sinus; one with and one without ligation of the jugular vein. The clinical data prove that streptococci in the blood do not necessarily lead to a fatal issue, but where the internal jugular vein is ligated, a more favorable prognosis is permissible.

As a result of the experience of the various authors quoted here, and that of my own, it is apparent that a large field of usefullness exists for the study of blood cultures in these obscure cases. Undoubtedly, the presence of a bacteremia in a patient with otitic disease under the conditions mentioned above means that sinus thrombosis is also present. Duel and Wright, however, in a study of 55 cases of otitic disease and two of frontal sinus suppuration, claim to have found a positive bacteremia in 16; 4 of which had definite clinical signs of sinus thrombosis; one acute diffuse leptomeningitis; one acute suppurative otitis media without mastoid involvement and 9 cases of mastoiditis without complications. They found streptococcemia present in all cases with clinical symptoms of sinus thrombosis and in the case of diffuse leptomeningtitis, but, in the 9 patients without any alarming symptoms, 7 had streptococci and 2 pneumococci in the blood and as a result. They arrived at the conclusion that when the clinical symptoms are pathognomonic of sinus thrombosis, a bacteremia is only a valuable additional confirmatory sign in connection with such symptoms. Their technique consists in inoculating broth with ten c. c. of blood and incubating it for two or three days and then centrifugalizing it. They claim to have demonstrated that in about 30 percent of cases with trifling symptoms of otitis, there are one or more colonies of streptococci in each ten c. c. of the patient's blood; so that, the proportion of cases actually having a bacteremia must be much higher than the figures would indicate. They also claim that in four other patients, they obtained positive cultures in simple mastoiditis with no clinical evidence of sinus involvement and uneventful recovery took place in all, thereby proving that a bacteremia does not exist in such uncomplicated cases. Dr. Duel also stated, however, that the early recognition of streptococcemia by means of blood cultures would undoubtedly lead to earlier operation and cause more gratifying results in many doubtful cases of septic thrombosis.

The work of these otologists just quoted, differs from that of others and does not agree in any way with our experience which consists at present of blood cultural investigations in about 130 uncomplicated mastoid cases with a negative blood culture in every instance and 50 sinus thrombosis cases with 42 positive cultures. The unique bacterial findings in the blood so frequently as Duel and Wright indicate, is unexplainable unless it be on the basis of differences in the cultural methods used. Surely, it is unsubstantiated by any other reports in literature and in no way vitiates our findings as is here clearly indicated.

The method employed at Mt. Sinai Hospital laboratory by Libman and Cellar consist in dividing equally about 15 c. c. of blood among boullion flasks and agar tubes, pouring the latter into plates immediately. Both boullion and agar were used with and without glucose. In some instances serum was added to the various media. Subcultures were made for the flasks daily, the principle points of difference between the two methods consists in the concentration of the blood and the centrifuging. Libman and Cellar, as a result of further studies on this subject, state that it is worthy of note that in not a single instance was the pneumococcus isolated either from the blood, or from the sinus clot where this could be investigated. It is generally found that the original middle ear infection within a very short time becomes admixed with other organisms. But the pus in the mastoid or sinus remains dependent on a single organism and a pure culture is obtained from this source. A definite uniformity exists, however, in the predominating organism found in the middle ear discharge and that found at operation in the mastoid. This fact to my mind emphasizes the great importance of taking cultures from the middle ear. The organisms obtained from the blood in cases of thrombosis of the sinus, invariably corresponded to that isolated from the mastoid with one exception and from the studies thus made, they conclude that nearly all cases of sinus thrombosis are accompanied by a bacteremia at some time or other and that cases in which streptococci are found in the blood after the mastoid has been properly operated upon and in which clinical symptoms persist and no other cause can be found for the streptococcemia, are cases of sinus thrombosis.

Comparing these results with those of Duel and Wright previously mentioned in which they state that the bacteremia bore no relation to the sinus disease, they are therefore quite at variance with the result of the authors mentioned. Duel and Wright found streptococci 14 times and pneumococci twice. The relative high percentage of the latter is of particular interest. In endeavoring to confirm the method employed by Duel and Wright, Libman and Celler utilized their method in 42 cases. They also employed this method in 27 cases (22 mastoiditis and 5 otitis) and their own method in 82 mastoid cases and 16 otitis cases, (98 in all) and obtained not a single positive culture. "To determine the possibility of bacteremia without clinical signs in local infections other than those of the ear, a study of 66 cases was made both by the Wright method and controlled by their own method.* This included empyema of the chest, various abscesses, septic infarcts of the kidney, appendicitis, furunculosis, multiple streptococci abscesses, carbuncle of the neck, paronychia, suppurative adenitis, phlegmon of the hand and neck, etc., and the results were uniformly negative in every instance. The cases selected were mild forms of conditions in which it was considered likely to have a positive result.

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*An unpublished report made at Mt. Sinai Hospital Clinical Conference meeting by Dr. Celler.

Our results agree in all respects with those of Leutert, in which he states that every case of bacteremia of otitic origin with the exception of meningitis, is accompanied by sinus thrombosis; and no bacteremia ever occurs in uncomplicated cases of mastoiditis."

These investigators also state, "as the result of later studies, they find no justification for altering the opinions already expressed concerning the relationship between bacteremia and diseases of the ear."

The cause of the bacteria in the blood stream from a sinus thrombosis, is the result of their separation from the primary focus and their multiplication in the blood; or, their presence may later be the result of a septic endocarditis, in which case the latter must be differentiated by the clinical symptoms, before the aural condition can be proven the cause of the bacteremia. However, in case the bacteria have been deposited in various portions of the body, it does not necesarily follow that all foci show bacterial activity at the same time, as some areas may become quiescent; while others become active in sending out organisms through the general circulation, although the bacteremia may, in *rare* instances, be continued from its original source in an indirect manner, as even after the jugular vein has been ligated, the bacteria *may* enter the general circulation by way of the petrosal sinus, or as the result of a concomitant meningitis. In the latter instance the meningitis is readily recognized both clinically and by means of a lumbar puncture. At some time or other during the course of an infective lateral sinus thrombosis, a bacteremia always occurs even in acute cases where there is a partial clot, and before a complete thrombosis of the vessel has had time to form. A blood culture will generally show a positive result, from the microorganisms present in the particular case being washed off in the blood stream from the inner areas of the partial thrombus. In some cases, however, no bacteremia will be present very early but within a short time thereafter repeated blood cultures will show a gradually increasing number of colonies. Experience has also shown that they may decrease in number and entirely vanish, even before any operative procedures have been employed. In long standing cases where the patient is doing well and yet presents clinically a certain degree of sepsis, there may be no bacteria found in the blood as the thrombus may have been disintegrated and particles carried to the lungs and lodged there. The bacteria are then confined in these emboli and remain localized in the pulmonary areas, either to become inoccuous there, or more frequently, to form septic infarcts. The explanation for this negative culture is in the anti-bactericidal action of the blood and the walling off of the lower end of the thrombus by the sterile clot.

A bacteremia of the streptococcus type, associated with the usual symptom-complex of chills and a septic rise and fall in the temperature, may also be found, where there is a thrombus of other venous channels of the body, especially so in the pelvic veins of the genito-urinary tract, of other cerebral sinuses, or of the veins of the extremities, as well as in the sigmoid sinus disease. When the symptoms arise from a thrombus of the extremity, there is marked local evidence of the disease, so that the cause of the streptococcemia is plainly evident. When, however, the other intracranial sinuses are the seat of a phlebitis, local symptoms are in evidence and the study of the case aids in elucidating the condition.

The presence of bacteremia is most suggestive in the absence of such other possible causes as have been enumerated and when there is a history of the presence of suppurative aural disease or where the symptomotology is obscure and an acute or chronic suppurative otitis is present, even though an endocarditis may also be present, it is advisable by all means to explore the sinus. The detection of a bacteremia should be possible in practically every case of sinus thrombosis and as further studies are made, the sources of error will undoubtedly become less and less. Negative findings may be obtained however and they may be the result of various causes, such as a sterile thrombus situated below the infected clot, which for a time at least, might prevent a bacteremia from becoming evident, or the cultures may be taken before the bacteria are thrown off into the circulation. In the latter instance, if a culture be taken a few hours later, the organisms will be found. It is also possible that, the powers of haemic resistance being greatly increased, all the circulating bacteria might disappear within a comparatively short time by a highly developing bactericidal power of the circulating fluid; or, it is possible that there may be such a small number of organisms in the minute quantity examined, hence not to be found. The number of colonies in each cubic centimeter has varied widely; in our experience being from one to 320, or again the culture may be taken too late in the course of the disease, after all the organisms had disappeared from the circulation. This is always the case within a comparatively short time after the jugular vein has been ligated, so that the original focus of infection is thus cut off and isolated as it were. Our experience shows that not frequently the blood becomes sterile a long time before the clinical symptoms disappear.

Illustrative of this point is the case of a young woman recently operated on. A large and firm thrombus was removed from the bulbar region. Owing to the critical condition of the patient upon the operating table, no attempt was made to ligate the jugular vein. Thirty-six hours later the clinical symptoms were so severe, that it was determined to proceed. However, the culture taken between the first and second operations and only reported after I had already ligated the jugular, was negative.

It is also be remembered, that there may be an entire absence of a bacteremia, yet the patient will show metastatic deposits in various portions of the body, as the result of a previous sinus thrombosis accompanied with streptococci in the circulation, which has been operated upon and entirely removed as a focus for infection. Such cases are the result of the early breaking down of a part of the septic thrombus, with a distribution of the microorganisms. This has ceased at an early stage and the local focus no longer acts as a factor in the septic dissemination and then for a time the blood is sterile, while at a still later period, the various metastatic deposits commence bacterial activity and local abscesses result. So, one can readily see that at some time during the course of the primary sinus thrombosis the presence of organisms in the blood is an essential fact; or, as their distribution is necessary in this way, for emboli to be carried to various parts of the body.

Following a mastoid operation where one suspects a sinus thrombosis, but where the symptoms are not sufficiently definite to warrant opening the sinus and a blood culture has given negative results, it is most essential that a second culture be taken, usually within a day after this time, and, if it is then found positive, the indication is clear. In case the condition still continues suspicious and yet the blood remaining sterile, repeated cultures should be made. For they will be found of great value in finally clearing up an obscure case, that otherwise might not be relieved by an operation until a much later period. The rule can be laid down that in the presence of streptococci in the blood there is a septic focus, and this is a definite indication that further operative measures are necessary.

Such findings should lead one to examine the ears, even though there are no symptoms calling attention to these organs. Several such instances have occured in our experience, patients being admitted to the medical wards as typhoid suspects. Given a patient presenting a rise in temperature, accompanied with chills, and a blood examination showing the prescence of streptococci, it is good surgery to explore the mastoid process and lateral sinus, provided another cause for the condition cannot be found and there is established the absence of a primary infective focus elsewhere.

Whiting, in discussing one of the papers previously quoted, asks the question, given a suppurative otitis media, and a blood culture showing the presence of streptococci, is one justified in making the diagnosis of a purulent lateral sinus thrombosis? If one can eliminate endocarditis, erysipelas, streptococcus pharyngitis and other septic foci and if the above conditions prevail, one is justified in seeking for a thrombus in the sinus. For, one can be reasonably certain that the bacteria in the blood are getting there from the infected ear but whether under such circumstances one should tie the jugular vein in every instance, we have not sufficient data at present to say. Certainly the presence of streptococci in the blood in connection with a suppurative otitis media, leads to the conclusion that it is a wise procedure.

Of fifty cases of sinus thrombosis here referred to, in forty-one the internal jugular vein was ligated and exsected. In those cases where the same was not done at the primary operation, over ninety percent subsequently required this procedure.

The persistance of streptococci in the blood after the sinus has been operated on and the thrombus removed, indicates that the internal jugular vein is the seat of a phlebitis and that the infected thrombus there is acting as a disseminator of microorganisms. Even should local or general symptoms of such a condition be absent, or should they be so slight that they alone would not warrant operative interference, still my experience teaches that the blood findings are sufficient indication for further operation. The number of organisms found in the blood however, in the presence of a lateral sinus thrombosis, whether accompanied with jugular involvement or not, bears no relation to the extent, or severity of the blood infection . For, an extremely severe case may show a minimum number of organisms to the cubic centimeter, while a comparative mild case, relatively speaking, (all these cases must necessarily be considered grave), may show a great number of colonies obtained from the blood culture. A rapid decrease in the number of bacteria in the blood after operation, as a rule, can be construed as a favorable prognostic sign.

From the number of cases which I have studied as regards the phenomena of bacteremia in relation to otitic suppuration, it can be definitely stated in conclusion, that the finding of bacteremia in the presence of a suppurative disease of the middle ear and its adjoining osseous spaces is proof evident of an infective thrombosis of the sigmoid sinus. Such a finding is warrant for immediate operation, while following the sinus operation, the persistence of streptococci in the blood, indicates that the internal jugular vein is involved and measures for its operative relief should be at once carried out.

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DISCUSSION.

Dr. S. H. Large, Cleveland, O.:—In thrombosis of the lateral sinus there has always been a question in my mind whether we are not justified in ligating the jugular, immediately after the diagnosis is made. Recently I saw a case in consultation, that was a clinical picture of thrombosis of the lateral sinus. I advised the radical mastoid with ligation of the jugular. The Otologist did a radical, opened the lateral sinus, evacuated the clot, but did not ligate the jugular. The patient made a rapid recovery. Personally I believe we should ligate the jugular in all cases of lateral sinus thrombosis, before the clot is evacuated; especially should this be done if our infection is due to streptococcus.

Now, the Doctor in speaking of the blood examination, says it takes two or three days to complete it. If in the operation there were any indications of lateral sinus thrombosis, and we had to wait two days, I am afraid the trouble might extend too far for any operation to do much good. Where there is any indication of thrombosis, there is no danger of ligating the jugular and opening up the lateral sinus.

With reference to Dr. Koptezky's paper, you know the labyrinth operation is new in America. Personally I have only done the operation in two cases. In the first case, I started to do the Jansen-Neuman operation; but my assistant made too strong a traction, causing a buttonhole perforation with oozing of the cerebro-spinal fluid. We then had to do the Richards operation. I think there is less danger of injuring the facial nerve in the Jansen-Neuman than in the Richards operation.

One good point the Doctor brought out, and that is in too vigorous curetting around the promontory and oval window, there is great danger of postoperative meningitis. Another thing, you can treat the granulation tissue through the external canal. Nature has fortified herself against invasion of the disease by throwing out these granulations, and any curettage in this area should be done with the greatest of care.

Dr. J. C. Beck, Chicago:—I have a slight advantage over you in knowing something about Dr. Kopetzky's paper, because I read part of it last night, and I believe I can bring out some of the salient points in his paper. The subject is too large for the time allotted, but I would speak of the cases of acute labyrinthitis, because they are the most interesting, although the results of his cases were fatal. Now he says the only way to do is not to mind the facial paralysis, that may result because you can do a subsequent anastomosis, if necessary, but save the life of the patient. In the acute cases with violent onset, with complete paralysis, remove the acute violently infected labyrinth. If I should come in contact with such a case as that, even in the presence of symptoms of meningitis, I should clean out the entire portion of the infected area. Therefore, I think from this report the practical point is that the acute cases should be operated in extenso when they present those violent symptoms.

In regard to Dr. Oppenheimer's paper. When the first report came of these examinations of blood cultures, I thought that this would develop a good point for the diagnosis of sinus thrombosis, but I haven't had many cases come to me since to test it out. I tested, however, the acute suppurative processes of the middle ear by blood cultures, and I found from the examinations that patients suffering from acute purulent otitis media did not show a bacteremia. That is a little different from what the gentlemen from the East refer to, but nevertheless that is my personal experience.

Now another point should have been mentioned here, and that is the diagnosis of sinus thrombosis by means of the X-ray. Dr. Large mentioned the fact he would not like to puncture the sinus to find out whether it was thrombotic. Now that is the way you have to do if you want to make a blood culture directly from the sinus. It isn't harmful. My experience with ligation of the jugular is excellent. When I have clear symptoms of thrombosis, I always ligate the sinus, notwithstanding the fact that cases get well without ligation. I do not wait for any marked symptoms of general sepsis.

Dr. J. A. Stucky, Lexington, Ky.:—Probably we have no pathognomonic symptom in sinus thrombosis; we have to take a combination of symptoms, and I rise to ask Dr. Oppenheimer, in closing the discussion, whether he ever finds streptococcus infection in the blood without a high leukocytosis and a large increase in the polynuclear percentage. It seems to me that the point sugggested by Dr. Large is well taken; that in many of these cases we cannot wait 48 hours, and I am quite sure now that in one instance I did not make the blood count often enough in a suspected case. It is best to have the counts made twice in the 24 hours. For instance, in a case reported by Dr. Oppenheimer, if the leukocyte count is 19,000 and the polynuclears 77%, the patient has a diarrhoea, is sweating, looks extremely septic and sick, and in 12 hours later another count is made, and the leukocytes have fallen to 11,000 and the polynucears increased to 90%, then I would operate at once. It shows the vitality of the patient is decreasing and septicemia increasing. I have in two or three instances operated because of the laboratory findings which guided me at the time, and had I waited for clinical symptoms, the operation would have availed nothing.

Dr. W. L. Ballenger, Chicago:—I first want to congratulate Drs. Kopetzky and Oppenheimer upon the excellence of their papers, and then make one point with reference to Dr. Kopetzky's paper. A specialist from another city came into my office and told me he had operated on a labyrinthine case with fistula. I asked him if he had tested the labyrinth and he said no. I asked him if he had operated on the labyrinth and he said yes. When I asked him what he did, he said he scraped out the fistula with a curette, and saw fluid flowing from the semicircular canal. I said to him, does the patient still hear. Oh yes, he said, the hearing is improved. Is he still alive? Oh yes, he said, it is six months since the operation. Well, I said, I hope you won't mind my being frank with you. In the first place, if there was a fistula and he had a functionating labyrinth you had no business to enter the labyrinth, and in the second place, I think you did not enter the labyrinth, as you say he hears better than he did before the operation and the patient is still alive.

This operator was lead to attempt the work by a paper read a few years ago by an eminent otologist, who had not yet digested the rationale of labyrinth surgery. I have recited the above incident as a caution against surgical interference in this class of labyrinth disease. This operator was inspired to attempt an operation upon the fistula by a premature and ill advised paper by an eminent otologist who reported a few cases thus operated. Just what the operator did to his patient I do not know. He certainly did not curette a fistula, a fortunate circumstance. Labyrinth surgery is usually an emergency procedure in those cases in which there is an acute infection of the calas or cochlea and in which meningitis is threatened or is already present as a result of the extension of the infection via the sheath of the auditory nerve. The operation is done to establish drainage. In chronic cases the infection is not often progressive as it is walled off by granulation tissue. In these cases the tympanic cavity and mastoid antrum and cells should be cared for and the fistula carefully.

Dr. Seymour Oppenheimer, New York City (closing):—Dr. Large raised the question as to primary jugular ligation, and I want to express myself as being in favor of primary ligation. This conclusion is reached on the basis that about 90% of all the patients that either I or my associates have operated where a positive blood culture was present and where the jugular was not ligated at the primary operation, subsequently required operation upon the jugular portion of the vein. Another point in that connection showing the importance of the blood culture: given a case of mastoiditis with sinus thrombosis with a positive culture before operation and a negative culture after operation, even though the clinical symptoms may be very severe, one is justified in delaying operation on the jugular. A case in point: A young woman whom I operated recently, for a very violent acute mastoiditis complicated with a sinus thrombosis. The thrombus I was able to shell out completely from the bulbar end of the sinus, and the condition of the patient being none too good, I decided not to ligate the jugular at that time. Following the mastoid and sinus operation the clinical symptoms were so extremely severe that I concluded there must be some focus disseminating septic material into the general circulation and so I ligated the jugular. A blood culture was taken after the mastoid operation, and the report handed me, after I had already performed the jugular operation, was negative. If I had waited for this report in this instance I would not have ligated the jugular. Another point demonstrating how the blood culture may be utilized in guiding the operative procedure, and this brings up a point in connection with Dr. Stucky's paper on erysipelas. The early developing general symptoms of a sinus phlebitis and an erysipelas are difficult to differentitate. For example: A child in the hospital in the service of Dr. C. May of this city. This child had a mild double acute suppurative otitis, with some oedema and swelling behind each ear. There was considerable lymphatic involvement. The excursions of temperature and the chills caused me to express the opinion that there was a probable primary jugular bulb thrombosis. That night Dr. May operated on the one side but failed to find anything. He was convinced however that a thrombosis was present on the other side and requested me to operate for him the following day. Owing to the disposition of my time I was anxious to defer the operation, but upon examining the child the physical condition was apparently so critical, that I deemed it necessary to operate at once. Operation failed to find any evidence of sinus disease.

The blood culture report submitted the next day, was negative. That night the diagnosis was cleared up by the development of the evidences of an intra-nasal erysipelas. If we had had the courage to wait for the blood culture report, the operation would have been avoided.

Dr. S. J. Kopetzky, New York City (closing):—I will add one word in reference to the blood culture in sinus thrombosis. I hope that we in New York will be able to thresh this question out, and that upon further investigation we will be able to get together on common ground. I see no reason why the technique which originated in the Mt. Sinai Hospital cannot be duplicated at the Manhattan Eye and Ear Hospital.

Now in regard to labyrinth surgery I do not want to be misunderstood as to my position, and therefore, will very briefly again repeat my conception of the indications upon which we shall or shall not operate. Acute labyrinthitis, do not operate on symptoms alone; acute labyrinthitis, with symptoms of meningeal infection operate extensively and operate early. Traumatic labyrinthitis, first observe the case, perform the functional tests and determine the injury to the labyrinth. Knowing the infection is traumatic, we know the route through which it travels, and in the absence of danger signs the caloric and other tests should be performed in an endeavor to estimate the limitation of the injury. In other words, in traumatic cases prophylaxis is the key-note.

To sum up, therefore, in acute cases our procedure is conservatism at first, and when conservatism is over perform a very radical operation. On the other hand in the chronic cases where there is time for observation, time for the performance of the various functional tests, we operate when the indications are met and the method of operation is a matter of individual decision and individual technique.

Regarding the question raised as to the injury to the facial nerve in the Richards operation, my experience has been that you can save the facial nerve as easily in the Richards operation as in the Jansen-Neuman operation. These operations are fundamentally the same digressing only in details.

Finally, I want to say that in chronic labyrinthitis, when the patient shows no signs of intra-cranial complications it seems to me uncalled for to open the cranial cavity every time you operate, and this is a necessity if you perform the Jansen-Neuman operation. The dura is attached to the petrous portion of the temporal bone and an injury to the petrosal sinus is to be feared in this operation, I, therefore, favor the Richards operation as the better of the two procedures.

MANIFESTATIONS OF THYROID DISEASE IN THE UPPER RESPIRATORY TRACT.

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A search of the literature on thyroid disease during the last decade reveals a voluminous and interesting record of observations and investigations from all departments of medical science, except laryngology. The meagre contributions from our particular branch calls for an explanation.

Can it be true that in most communities, the neurologist, the surgeon, and the internist, and the ophthalmologist, claim these cases exclusively and consider observations of the laryngologist as immaterial and without a scientific suggestion that is worth the trouble? If this suspicion is correct the fault is with the laryngologist who fails to find symptoms and lesions sufficient to prove his interest and value in the case.

The phenomena of the various forms of thyroid disease are so extensive that the majority of specialists may lay a claim for consideration, but in my experience, the greater number of these city patients, will refer their symptoms to the the throat or eye and seek advice accordingly.

The cases of impaired function that particularly interest us are the numerous varieties of atypical forms of Graves' Disease and myxoedema that occur between the extreme manifestations of these disorders. Hyperthyroidism or Graves' Disease and so-called atrophic thyroiditis, or myxoedema, present distinct and definite diagnostic signs for classification, yet in the modified or atypical forms they interchange and the same patient may exhibit at the same time a well defined Graves' Disease with marked myxoedmatous symptoms.

Before discussing this problem from our special point of view it may be well to enumerate the general diagnostic signs according to the classification of Beebe and Rogers.

CLASSIFICATION.

Hyperthyroidism.—More common in young women, 18-30.

ONSET—May be slow and gradual or sudden and acute.

TACHYCARDIA—120-180; pounding beat felt over a wide area; often a loud systolic murmur over apex, base and along the great vessels. Irregular from, and very susceptible to the effects of exercise. Blood pressure variable, generally low, pulse soft and full, marked dyspnea on slight exertion, Marked edema of legs.

NERVOUS SYSTEM—Fine tremor affecting nearly all the muscles, twitching and occasionally spasms. Patients are abnormally irritable and excitable, apprehensive, mentally very active and physically restless. Muscular weakness prominent.

EYE SIGNS—Exophthalmos generally present, although it is not invariable. Occasionally unilateral, corresponding to the side having the enlarged thyroid lobe. Various symptoms arise in consequence of the exophthalmos. No pupillary changes.

GLAND—Enlargement varies from nothing to very large goiter. The blood vessels over the gland are generally much enlarged and pulsate markedly. Right lobe generally the larger.

NUTRITION—Severely disturbed; in most cases there is a loss in weight, which may progress to extreme emaciation. Appetite variable; vomiting and diarrhoea frequent complications. Patients drink a great deal of water.

SKIN—Profuse perspiration, erythema, urticaria, dermographia; pigmentation, which may occasionally be so marked as to suggest Addison's Disease. Hair falls out, but is not coarse and dry. Patients prefer thin clothing and cold rooms. They are more comfortable during cold weather than during hot weather.

TEMPERATURE—May be only slightly elevated, 99-100. With severe acute cases it runs often to 102-104.

URINARY FINDINGS—In most cases normal in volume; glycosuria not unusual; poluria often observed in later stages. Nitrogen proportions show a very much decreased kreatinin excretion, while kreatin is present in large amounts. Nitrogen loss is marked during the period of emaciation.

BLOOD—Hemoglobin low, leucopenia in severe cases, with a marked relative lymphocytosis.

MENSES—Very irregular or completely suppressed.

Hypothyroidism.—More common in advancing years, 35-50.

ONSET—Slow and gradual, in many cases engrafted on an old Graves' Disease.

HEART—Rarely above 100, may be irregular with heaving impulse. Pulse generally shows high tension and the blood pressure is above normal.

NERVOUS SYSTEM—Patient may have some tremor and muscular weakness is likely to be very pronounced, but there is not the same restlessness and jactitation. Patients are occasionally irritable, but they are generally dull and apathetic, mentally slow; memory defective. Pains in joints frequent, and referred to as rheumatism; there is a marked tendency toward sudden giving-way of the legs when walking.

EYE SIGNS—Exophthalmos is unusual, although it may have been present at one time.

GLAND—Often no enlargement can be made out; when there is a goiter it has an elastic, rubber-like consistance, occasionally cystic and nodular, but very distinctly different from the active pulsating gland of Graves' Disease.

NUTRITION—Generally not seriously disturbed; patients hold their weight and in most cases gain slowly; constipation rather than diarrhea, and flatulency a troublesome habit. Patients do not drink much water.

SKIN—Dry, may be scaly; patients do not perspire on exertion; hair and nails dry, brittle, and scalp scaly. Pigmentation not common. Patients prefer thick, warm clothing and are cold most of the time. Much more comfortable during hot weather.

TEMPERATURE—Subnormal, may reach as low as 95.

URINARY FINDINGS—Albuminuria not unusual. Nitrogen proportions do not show so marked a disturbance in kreatinin and kreatin ratios. In large number of cases urine practically normal.

BLOOD—Hemoglobin low, white blood count normal.

MENSES—Generally regular but scanty.

We note in addition to this classification that the development of Graves' Disease is influenced by the hereditary history of thyroid, heart and nervous diseases; that it follows most frequently from fright, strain, overwork, nervous shock, or infectious disease. It is interesting to observe that the hyperfunction of the thyroid is in no relation to the size of the goitre.

Capille has observed that 79% of exophthalmic goiters that came to autopsy had enlarged thymus. This is of diagnostic importance as thymus cases are attended by enlarged tonsils, spleen, and follicular glands of the tongue. The dangers of surgical intervention are greatly increased in these cases. Two cases of myxoedema reported by Theisen and E. L. Shurly had their origin from removal of an accesory thyroid in the region of the lingual tonsil and which gave the appearance of benign tumors in this location.

It is a well recognized fact that the faucial tonsils are in definite interrelation physiologically and pathologically with the thyroid gland. It is fair presumptive evidence that a tonsillar internal secretion exists which affects the governing action when we find that a series of enlarged thyroids will subside after complete enucleation of the tonsil.

We know that septic processes such as tonsillitis, quinsy, scarlet fever, measles, typhoid fever, and influenza that attack particularly the lymphoid tissues are frequently direct etiological factors in the development of exophthalmic goiter. Indirectly then it may be argued and demonstrated that tonsillectomy has a place in the prophylactic treatment of Graves' Disease.

Tonsillotomy however, has proved of little material value in prevention. It is necessary to wait at least a decade before a collective investigation can define the true influence of the complete enucleation operation upon the thyroid in particular and the system in general.

The effects of thyroid toxemia and deficiency are so profound upon the nervous, muscular and circulatory systems, that it is logical to expect a majority of these cases will present special manifestations in the upper respiratory tract· The unstable vaso-motor system especially renders the subject liable to annoying symptoms in the nose, throat and ears.

In the moderate or severe myxoedematous forms we notice defects or changes in speech in many cases. We also find varying degrees of slowness and difficulty in articulation. The voice at intervals becomes husky or thick and the mucous membrane of the larynx, pharynx, tongue, mouth, and lips, becomes swollen and dry through deficient lubrication. The change in the voice may be associated with a motor insufficiency of the laryngeal muscles. Matthews of Rochester, Minn., has reported two hundred and eighty-nine cases of laryngeal paralysis in one thousand cases of goiter; seventeen of these were bilateral. Although my experience is limited, it would seem as if slight motor insufficiency had been classified as paralysis. In the majority of his cases of goiter the frequency of pressure symptoms is in proportion to the size of the goiter.

In myxoedema, however, the goiter is usually small, and the change in voice will be out of all proportion to laryngoscopic findings. Again a considerable paresis may be attended by little or no change in voice. Impairment or perversion of taste is occasionally prominent. Howard in a carefully studied series of thirty-two cases found six with abnormal taste. Hun and Prudden report 33% as deficient in taste.

Two of my cases presented themselves for treatment—suffering from a most distressing tinnitus aurium. The symptom was so annoying that sleep was obtained with difficulty. The aural examination was completely negative and relief was obtained by general treatment. Some observers report impaired hearing in 78% of cases. Whether this is due to hyperaemia and swelling of the auditory nerve, trophic changes, or some direct vaso-motor change is difficult to explain.

In Graves' Disease, taste, smell, and hearing are more rarely affected. In severe myxoedema, hemorrhages, from the gums, nose or throat are common, although unusual in the atypical forms. The patient may consult the laryngologist, complaining of dyspnoea on slight exertion; when a careful examination may reveal no physical signs of pulmonary disease. This symptom is often associated with falling hair, brittle nails, dry skin, and other phenomena of early atypical myxoedema, which will respond to treatment by thyroid feeding, or the administration of iodine or phosphorous. Dyspnoea in Graves' Disease is a late symptom—usually associated with myocardial or other cardiac change, and may be attended by a limitation of the expansion of the chest. Acidosis, and a "fruity breath" may attend this phenomenon.

I have observed with Lemm, Curtiss and others that a peculiar infiltration of the nasal mucous membrane may occur, in myxoedema— as one of the early signs; and later the membrane becomes thickened, and the nose, obstructed, by a gelatinous, waxy, or yellowish, secretion. Some of these patients complain of a full cramped or swollen feeling in the throat. The changes in coloring may be transmitted to the pharynx and larynx. It may be pale yellowish, or have a bluish tinge. The uvula may be elongated, or angio-neurotic phenomena may appear. The interarytenoid fold may be transparent. No change in function of the vocal cords is usually seen.

The symptoms of cough may bring the patient to the laryngologist when associated with Graves' Disease. It may be attended by a dry throat and husky voice. In several of my cases this was the predominating and annoying symptom uppermost in the mind of the individual. The temperature, cough, precordial, pain, unilateral bruit, and loss of weight had been sufficient in a number of my cases to lead the attending physician into a diagnosis of suspected pulmonary tuberculosis; others were sent to me by members of the family under the same apprehension. Bronchial and pulmonary hyperaemia are exceedingly common in Graves' Disease·

The cough may be associated with intralaryngeal pressure from a hard swollen goiter. In this condition the amount of cough may change either with position, diminish or increase with the consistency of the gland. The myxoedematous forms more rarely cause cough, although slight pathology in the upper respiratory passages is attended by symptoms out of proportion to the lesions. This may be explained on the basis of the abnormal psychic condition of the individual.

A disease like exophthalmic goiter that passes through many intervals of quiescence and exacerbations must necessarily exhibit a long list of remedies for which great curative value is claimed. The great majority of drugs are useless except when occasionally indicated for the control of special symptoms. The therapeutic measures which I have adopted in this series of thirty cases are those selected by elimination. Rest is certainly essential to success.

A considerable advantage may be obtained from the proper use of the galvanic current. A small (anode) electrode should be applied along the cervical sympathetic. The cathode, should be larger, sponge applied to the neck, along the lower cervical vertebrae, beginning with a one milliampere current and later, gradually increasing the dose.

In a number of cases a sedative effect may be noted upon the cervical sympathetic and general nervous system. The dry and swollen mucous membranes are best relieved by the use of menthol and camphor application and inhalation. The use of licithin, phosphorous, or soda phosphate in carefully directed dosage is often of great service. Many of the cases combined with myxometous symptoms improve under the administration of pure iodine, especially by the hypodermic method. The X Ray may be of value.

Six cases were treated with the Beebe and Rogers serum with striking improvement. Three of these patients might be classified as complete recoveries· Two of the thirty, were operated by general surgeons, one of whom died the following day. Immediate operation was dvised in another that died suddenly from pressure ten days later untreated. The question of surgical interference is exceedingly important. A study of the individual case alone can definitely determine this problem. Medical treatment without improvement should not be prolonged. When surgery is considered necessary the choice of the surgeon is of paramount importance. The best technicians have from one two five percent mortality.

In myxoedema and especially the atypical forms, great relief and lasting benefit is attained by the administration of thyroid extract in the carefully selected dosage of carefully selected preparations. The results of this substitution therapy are among the greatest achievements of modern science.

It is evident that the role of the internal secretions as governors and regulators of harmony in the functions of the upper air tract is important and significant. It is demonstrable that the tonsils and thyroid are concerned in some delicate and complex influence upon each other and that a wide inter-relationship exists among the ductless glands. These mysteries of bio-chemistry are being unraveled, meanwhile the clinical observer must stand bye and report the signs and symptoms as they appear to him and apply his treatment according to his most modern conceptions.

In view of the numerous symptoms and conditions of Graves' Disease and myxoedema with the intermediate forms that are referred to the nose, throat, and ear, it would seem to me within the rules of modesty to respectfully suggest to the internist and surgeon that his case had not been completely examined until the laryngologist and otologist had added his diminutive, but sometimes important contribution to the general information.

DISCUSSION.

Dr. Kate Wylie Baldwin, Philadelphia:—Cataphoresis by means of high frequency or violet rays has proved of some good in cases I have known.

Dr. E. Mathers, Akron, O.:—I quite agree with Dr. Shurly in the statement as to the importance of examination of the upper respiratory tract as to the local symptoms and the possible relation of cause and effect between the suppurative conditions there and the goitre itself. In a very large percentage of cases—I have not collected and analyzed my statistics yet,—but in a large percentage of cases there was evidence of severe acute infection of the accessory sinuses preceding the onset of exophthalmic symptoms, and consequently it is necessary to give attention to these conditions.

Dr. Otto J. Stein, Chicago:—One point I would like to speak of and emphasize, and that is the inter-relation between the tonsil and thyroid conditions. I believe there is a vast field there, not only for observation, but in the treatment of symptoms of hyperthyroidism, as we see it in young people, and the fact that we are recognizing now more and more that a complete enucleation of the tonsil in this associated condition is going to lessen the development or manifestation of a beginning hyperthyroidism. I think possibly it will abort in some of these cases—I feel that I have done so—the symptoms of Graves' disease by a complete enucleation of the tonsils. Of course, this is a large phase of the subject, and does not admit of any discussion in a few words, but I want to emphasize that point, which the Doctor has mentioned several times in his paper.

Dr. J. C. Beck, Chicago:—I just wish to take the opposite view of the last speaker. In four cases of exophthalmic goitre, in which I did a tonsillectomy previous to the general surgeon operating on the goitre, a sufficient length of time had elapsed to see any effect on the goitre or any effect on the general symptoms, and there was none. Just as Mathers said, there were general symptoms as well as findings in the throats of these patients, but the removal of tonsils did not have any effect on any other symptoms except the local symptoms in the throat, which the patient had. While I would like to see it the other way, I must say that this has been my experience. I would like to ask Dr. Shurly as to his knowledge of Sajous' experience along this line of organotherapy.

I would like to say for the gentlemen that in those cases which I operated on there was absolutely no difference from any other tonsillectomy.

Dr. J. M. Ingersoll, Cleveland, O.:—I was interested in the question of supernumerary thyroid, as to its influence upon the thyroid itself. I had one case in which the supernumerary thyroid had some effect on the thyroid itself. I might say that the removal of the supernumerary thyroid is a very bloody operation.

Dr. W. D. Black, St. Louis:—What effect did the cocaine have upon the heart in taking out the tonsil. Where you already have a tachycardia, I thought the cocaine might influence it.

Dr. Otto J. Stein, Chicago:—I believe I have been misunderstood in the remarks I made. I did not mean to state that enucleation of the tonsils would relieve the symptoms of Graves' disease. I mean exactly what Dr. Shurly has said in his paper, only so much better than I could have said it, that the beginning symptoms—what might develop into Graves' disease, goitres, and other symptoms suggestive of it—seem to disappear on tonsillectomy.

Dr. B. R. Shurly, Detroit, (closing):—There is a misunderstanding in regard to the way I look upon tonsillectomy in Graves' disease. I don't believe that a tonsillectomy in a well developed Graves' disease will do a particle of good, and I don't believe I made such a statement in the paper. There is a relation between some of the simple goitres, which are not Graves' disease and which are not myxoedema, but which later on in life take on some of these systemic changes. In some of those cases you will often see a simple goitre subside after removing the tonsil entirely. I have watched a number of cases that have had tonsillectomy, and that later developed Graves' disease, which shows that tonsillectomy does not influence these conditions. The point is that there is a relationship which we do not understand, but as soon as a diseased tonsil is completely removed, sometimes—not very often—a thyroid gland will disappear.

In regard to the use of adrenalin; it is a fact that the suprarenal gland very frequently is diseased in combination with the thyroid. In those cases where suprarenal trouble and a deficiency in the secretion from the suprarenal gland exists at the same time that we have abnormal phenomena with the thyroid gland, these cases will do remarkably well under the administration of adrenalin. In regard to the use of cocaine, I don't believe that I have ever done a complete tonsillectomy on a Graves' disease when it was in the active stage, and therefore as to the use of cocaine I really don't know. I would expect it to be attended by very bad symptoms.

CYLINDROMA OF THE NASAL CAVITIES, WITH REPORT OF A CASE.

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The subject of cylindroma, while not new, is one in which much confusion exists among pathologists of this country and Europe, as regards its exact nature and classification. Many classify it as being of the sarcoma group, others of the endothelioma and a few as carcinoma, while, in fact, cylindroma proper belongs not to any of these, but to a distinct form of tumor whose essential feature is that it is not malignant in the sense that it produces death but rarely and then only when it invades some inaccessable structure or occasionally by taking on malignancy.

The usual type of tumors called cylindromata by these authors are those which have the peculiar formation of hyalin degeneration and mucoid material with a stroma similar to that of sarcoma, endothelioma or carcinoma.

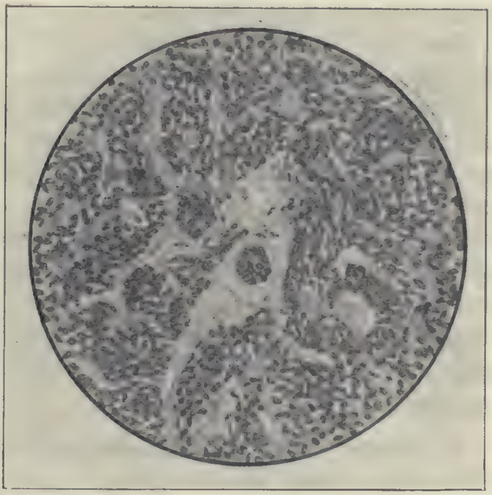
The word cylindroma should not be used in speaking of those tumors which have the characteristic elements of malignant growths plus the hyalin cylinders, but should be used with those classified as carcinomata with hyalin degeneration, sarcomata with hyalin degeneration, or endotheliotamata with hyalin degeneration and to that form of distinct tumor which *Ribbert of Bonn* gives the following description:

Macroscopical Appearances.

Cut surfaces show a reticular structure containing many cavities which are filled with mucoid or hyalin material.

Microscopical Appearances

There is always a connective tissue stroma and imbedded in this we find masses of cells which are clearly epithelial. Sometimes you find large multiple formed masses of cells which are connected with each other. The most externally situated are placed upon the stroma in regular rows and are sometimes distinctly cylindrical. These larger masses are connected with more narrow extensively reticular masses. This pictures a close resemblance to carcinomata, but differs from them in the development of the cells within a closed tumor with simultaneous growth of connective tissue; while in carcinoma the epithelial cells grow into adjacent tissues. They may be found single, but in the large epithelial masses they are found in long columns of various sizes. They (hyalin balls) are of two-fold origin, (a) due to an accumulation of the secretion of these cells; (b) these spheres or hyalin balls may occur from connective tissue; from buds growing into the masses of epithelial cells and becoming hyalin.



Cylindroma.

The origin of these cylindromata is due to disturbances of the development of certain glands. A little lobule of a salivary gland, or one from a mucous gland may become separated from the rest and then take on an irregular growth. The rare primary cylindromata of the skin are probably derived from the sweat glands. The growth of cylindroma is slow and continues for years. It is at the beginning always expansive and as long as this is the case the tumor can be extripated. Later the growth may invade the immediate neighborhood and in exceptional cases take on malignancy by growing into the vessels and produce metastases. Dr. Tiedman (St. Louis) examined specimens of ten cases and agrees with Ribbert that they are a distinct type of tumor and benign.

I think that this subject is of vast importance since according to the old idea of tumors, cylindromata were classed under the head of malignant tumors and consequently the prognosis was usually grave and much disfiguring surgery done.

Cylindromata are most frequently found in the region of the orbit, nose and mouth. In the nose they are very rare, and are most frequent in the antrum; they are also often found in the salivary glands, tongue, gums and occasionally in the skin.

The diagnosis is difficult and requires a competent pathologist. One should always be cautious in giving a grave prognosis in any supposed case of malignant tumor of the nose or neighboring cavities, owing to the fact that cylindromata do exist and that it is difficult for many pathologists to distinguish one from the other.

The history of the case is as follows:

Mrs. X., Age 33. Weight 104. Height 5 ft. 6 in. Ger.-Am. Married, one child. Visited a rhinologist four and one-half years ago concerning her condition. She complained of nose bleed. He treated her for two and one-half years without much benefit. She then went to anther specialist who operated on her many times for polypi, but did not remove much of the tissue on account of the severe hemorrhage. During all this time she did not lose weight and felt fairly well except for the nasal trouble. The rhinologist referred the patient to me for operation.

She gave no history of any organic disease and no syphilis. Speech decidedly nasal; sense of smell absent on the side of growth, external appearance of nose normal.

Anterior Rhinoscopic Examination.

Right nares stenosed owing to a decided deflection of septal cartilage making it difficult to make out the turbinals and septum. Applied cocaine and could then make out the turbinals which were hypertrophied. Septum normal except for the deflection.

Left nares completely filled with a growth, with the exception of the anterior part of septum. The slightest touch caused profuse bleeding which required pressure to control it.

The color of the tumor was grayish white and seemed to change to a delicate pink along the septum. Post rhinoscopic examination showed the post-nasal space on the left side completely filled with the tumor. Made a diagnosis of myxosarcoma; removed a piece as large as a hazel nut and sent to a pathologist who reported that he could not tell what kind of a tumor it was. Decided to clean out the mass and send specimens to another pathologist. The operation was very difficult owing to the great amount of bleeding and had to desist after tunneling a passage the entire length of the nasal cavity. Inserted intranasal tampons and replaced them every second day for seven days. Again operated to remove the remainder which bled quite as much as the first. Removed the mass from the post-nasal space with adenoid curettes. There were a couple of places on the septum where the tissue was adherent and required scraping with a sharp curette to remove them. The tumor seemed to grow principally from the septum, beginning at the mucocutaneous junction, spreading over the greater part of cartilage and bone and there growing outward and filling the entire nasal cavity. There were two or three places around the angles of the deflection, where the tumor could not be thoroughly cleaned out owing to the cartilage and bone being thinned.

Two months later on examining the right side, found it contained a small mass, about one-half the distance of the nasal cavity, growing from the bony part of the septum. Removed a piece of this and the pathologist reported it the same tumor as was found on the other side. A week later I noticed a return of the tumor on the septum at the original site and think that growth had penetrated cartilage and the bone. Decided it could not be eradicated unless the septum was removed, leaving just enough to prevent sinking-in of the dorsum of the nose.

Dr. Tiedmann's (Pathologist of Washington University) report is as follows:

Microscopical examination of the pieces removed from the nasal cavity show the structures characteristic for the growth called cylindroma. There are masses of cells having the appearance and arrangement of epithelial cells, surrounded and invaded by hyaline connective tissue. The cell masses very much in size and shape; they appear round or oval, and have a large deeply staining nucleus and little protoplasm. Generally the cells are so closely packed that no cell outlines are seen. In these epithelial cell masses are to be found sharply outlined round or oval masses of a fine granular or thready material which takes a faint blue stain with hematin. These masses are evidently a secretion of the epithelial cells. In places the masses are large and numerous, and separted from each other only by thin septa, in other places the masses are small and far apart.

The connective tissue has generally undergone a hyaline change; in some places this hyaline change has only begun, and there are found many oval connective tissue nuclei, close together.

At first sight, the microscopical picture, closely resembles that of carinoma and cylindroma. I lay stress on these points. The general hyaline change of the connective tissue, the masses of secreted material between the cells, the absence of pleomorphism of the cells, and the absence of degenerative changes in the cells.

DISCUSSION.

Dr. J. C. Beck, Chicago:—What became of the patient?

Dr. W. D. Black, St. Louis:—I intend to operate again and remove that part of the septum covered by the growth. It will be necessary to take away cartilage and a good portion of the bone.

Many of these cases diagnosed as carcinoma are really cylindroma, and when operated thoroughly are cured. Dr. H. E. Miller, of St. Louis, had a case where the first pathologist reported carcinoma. The patient was living four or five years later and upon making another examination of a specimen from the tumor it was found to be a cylindroma. The same mistake is often made in regards to tumors of the salivary glands, antrum, and tongue. Many of the cases that are operated as malignant growths and reported as cured, are cylindromata.

SOME INTERESTING LESIONS OF THE MOUTH.

T. E. Carmody, M. D.
DENVER, COL.

Only in the last few years has the medical profession paid attention to diseases of the mouth either because most affections were considered of little consequence and referred to the denist or trifled with and and the gravity not recognized until too late.

My reason for bringing the subject before you is that diseases of the mouth should be treated by the rhino-laryngologist either in conjuction with the dentist, or after special preparation and study in dental anatomy and pathology. The dentist is not prepared to do the major operations about the mouth, such as the resection of the maxilla or mandible, neither is the average rhino-larngolist, nor it the latter able to diagnose conditions of the mouth any more than the former can diagnose conditions of the nose. Very few rhino-larynglogists examine the mouths of their patients closely enough to tell whether they have any teeth except the incisors and cuspids, and yet they look into the oral cavity of practically every patient they see each day.

A closer study of the oral cavity of our patients will reveal not only the deformities of the jaw caused by mouth breathing, but many other interesting and instructive conditions as well as a few which may help in clearing up conditions of the nose, throat or ear, which have been puzzling us. Frequently we may be of some slight service to the patient by suggesting timely interference in some condition which he may not have noticed.

Case I. H. A., patient in National Jewish Hospital for Consumptives, Jew, aged 24, born in Russia; father died at 66, cause unknown; mother, 65, living and in good health; one brother died of some brain inflammation; one sister living and well, age 40.

Tuberculosis of lungs, two years duration; haemoptysis once; present weight 148 pounds., height 5 ft. 10 inches; sputum mucopurulent; few bacilli, pus cells, staphlococci; diagnosis, chronic catarrhal tuberculosis.

Present trouble, June 15th. Complained of pain in the region of upper left 2nd. molar tooth. Was examined by Dr. Barrin, staff dentist, who referred him to nose and throat department during author's service

June 20th. Slight swelling of parotid gland.
June 22nd. Temperature 100,, pulse 194.
June 23rd. Was first seen by author.

Examination: teeth normal except upper left 1st molar, also right

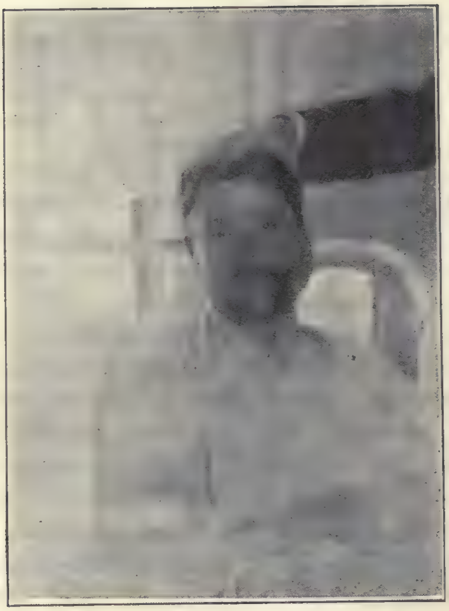


Fig. 1.
Swelling of Left Parotid.

second molar absent, and cavity in 1st. molar which had been filled; mucous membrane of the mouth normal except, slight swelling and redness around orifice of Stenson's duct upon left side; nose, pharynx, and larynx normal; very slight redness of the left membrana tympani and swelling anterior wall of cartilaginous portion of canal; hard swelling of left parotid gland simulating an attack of parotitis and as no history of a previous attack could be ellicited, it was so diagnosed in face of the fact that patient admitted at this time that he had received a blow from the fist of another patient in and altercation a few days previous.

June 27h. Some softening.

June 28th. Using ethyl chloride spray. Opening was made beneath the angle of the jaw evacuating about one and a half ounces of pus. Rubber drainage tube introduced. Examination of pus showed only diplococci present. Discharge of pus mixed with salivary secretions. continued.

July 25th. In dressing, interne opened another abscess which apparently was walled off from the orginal cavity by an intervening gland septum.

Aug. 2nd. Temperature 100, pulse 110. Under chloroform anaesthesia the cavity was curetted, bringing away a large amount of gland tissue. Microscopical examination of this tissue showed large numbers of turbercle bacilli, but no diplococci.

Aug. 4th. Rapid swelling of the right parotid. This had been anticipated as patient had complained of pain in this region for three or four days previous.

Aug. 8th. Temperature 100, pulse 110. Under chloroform anaesthesia, abscess was opened under angle of jaw. Pus showed not only diplococci, but tubercle bacilli present in large numbers. Pus and saliva continued to discharge from the wound. Bacteriologist at sanatorium reported the diplococci found, to be identical with the organism of paratitis. Smears directly from pus showed a diplococcus five tenths to one and a half micrones in diameter, intracellular and extracellular; gram positive no capsule; no development in ordinary media but abundant growth on mixed sterlized saliva with glycerin- agar agar; stopped propagating at 38 C.

Right still shows discharge of pus and saliva while left only discharges saliva through fistula which will be closed by operation.

One very interesting point in this case is that we had no facial paralysis on the left side although nearly the whole parotid gland sloughed. The connective tissue septa and nerve trunk probably resisted infection. The right side showed some drooping of the eye lid which recovered.

Case II. Miss H. skiagraph showing portion of right 3rd. molor in maxillary sinus, in girl of fifteen, which caused bulging of anterior wall sinus. Diagnosis, dentigerous cyst.

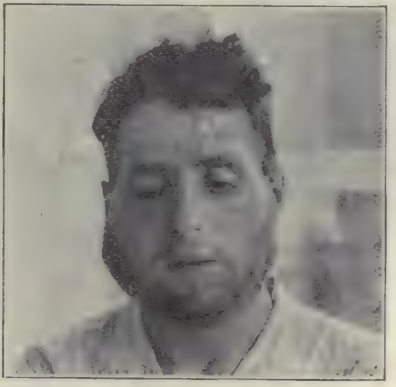


Fig. 2.

Swelling of Right Parotid Gland.

Tooth removed, and at present two and one half years since operation, both sides of the face show equal development.

Case III. Mr. S., skiagraph showing two impacted upper third molars.

Fig. 3.

Partly Developed Tooth in Maxillary Sinus.

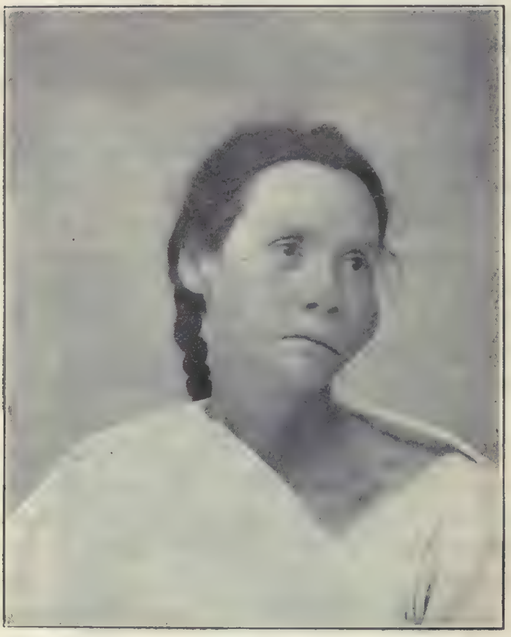


Fig. 4.

Fig. 5.

Case IX. Mrs. E., skiagraph showing fully developed cuspid and molar and partially developed bicuspid in left maxillary sinus. Second slide shows the forcing outward of anterior and buccal walls. Teeth removed and sinus curetted. Specimen showed small spindle celled sarcoma. Maxilla was removed ten days latter after ligation of both external carotids.

This sinus had been operated fifteen months before consulting author but no teeth were found.

Case V. A. D., male nurse, epithelioma of tongue which was confirmed by the microscopr. Patient was treated by anothed physician who stated the trouble to be syphilis. When seen next, two months later, the case was inoperable.

The author believes that the peculiar odor of these growths should be sufficient to suggest epithelioma and although this may be said to be ancient, it nevertheless should lead us to employ other and modern methods. This odor, once experienced, can never be mistaken or forgotten.

The epithelioid type of carcinoma of the tongue is much more frequent than is commonly supposed. Andrew of Glosgow presents some very interesting as well as surprising statistics relative to epithelioma of the tongue. Of 118 cases comprising various diseases of the tongue, such as abscess, hematoma, glossitis, leukoplakia, papilloma, and tuberculous ulcer, 98 were cancer of the epithelioid variety. Of the 98 patients, 88 were males and 10 females. These figures are similar to those found in 469 cases of epithelioma the order of frequency was: tongue, lower lip, esophagus, penis, cheek, larynx and tonsil. A epithelioma of the tongue comprised 20.8 per cent of all cases of epithelioma seen in a period of ten years. Of the 118 cases there was only one case of tongue syphilis, or 0.8 percent. The tongue and floor of the mouth are very rich in blood vessels and this combined with constant muscular movement of the tongue, produces a quick extension of the cancerous process into the submental and submaxillary glands.

The entire statistics cited by Andrew cover the histories of over forty thousand cases of general diseases, and bear out the opinions of rhinologists and stomatologists who naturally see cases of tongue diseases more frequently than the average general practitioner.

It needs to be emphasized that tertiary syphilis is rare in the tongue—a fact which is by no means well known. Recently two cases were reported in which several physicians diagnosed gumma of the tongue and the patients were given iodids in large doses. Each of these cases, when a section of the tongue was taken, proved to be epithelioma and all were practically inoperable at the time of the true diagnosis was made.

However, if the patient has had an initial syphilitic lesion it is necessary to be on our guard, for Brandt of Berlin says that it is not uncommon to find carcinoma arising from the base of a syphilitic ulcer and Koerner of London has seen at least twelve undoubted cases in the tongue. These observations are somewhat discounted by the statement previously made relative to the infrequency of the syphilitic tongue conditions, but the possibility should be kept in mind.

A leukoplakia, a fissure or ulcer of the tongue should not be temporized with, but a portion of the growth should be submitted early to microscopic examination. It needs scarcely be stated that the cure of cancer anywhere in the body depends on early diagnosis and complete eradication. Anything short of this means that the patient is deprived of the only opportunity he has of preventing a speedy and fatal termination of his malady. It is well, therefore, to be constantly on guard as to all suspicious lesions of the tongue.

Case VI. B., male, age 21, pulmonary tuberculosis of four years duration. Tuberculous ulcer in the region of the lower 3rd. molar tooth which had been exrtacted some weeks before—probably infected from sputum.

Case VII. Tuberculous ulcer of tip of tongue in a man, age 33, suffering from pulmonary tuberculosis.

Case VIII. Tuberculous ulcer of border of tongue in man, age 36, suffering from pulmonary tuberculosis.

Case IX. Chancre of tonsil in male, age 19.

Case Xs Chancre of lip, woman age 24.

Case XI. Ulcerated gumma of palate, woman, age 26.

Case XII. Fibroma of gum caused by ill fitting uper plate on woman, age 50.

Case XIII. Seen in consultation. Tongue deviating to left due to partial paralysis on account of stretching left hypoglossal in removing diseased submaxillary gland. Recovery in a few weeks proving nerve was not severed.

Case XIV. Mr. L., age 65, leucoma of lip. Smoked and chewed tobacco for a number of years and patch first appeared at point where pipe touched lip.

Case XV. Mr. A. age, 54, leucoma of tongue. Smoker for many years; history of syphilis twenty years ago.

Case XVI. Fissured tongue in patient with history of considerable gastric and intestinal indigestion.

Case XVII. Hairy or black tongue in male, 28 years of age, condition as shown in slide, appeared about two years ago and disappered in few months without treatment. Recurred four months ago and it gradually disappeared.

Note: Since reading above paper, author has seen a case of gumma of tongue heal after one administration of the Ehrlich-Hata 606.

DISCUSSION.

Dr. Bernstein, Kalamazoo, Mich.:—What relation exists between smokers and cancer of the tongue? I want to know what percentage of male you find with cancer of the tongue and in what percentage of the cases did there seem to be a direct relation to smoking?

Dr. T. E. Carmody, Denver:—I cannot speak about cancer of the tongue alone, but as to cancer of the mouth I have had three cases, one of the tongue and two of the jaws, in which the men were not smokers, but they had chewed tobacco for a number of years. However, all the statistics which we can find show that cancer of the tongue, of the cheeks, or of the jaws, is much more frequent in males than in females, so that it would seem to be due to a great extent to smoking. A great many people may not smoke, but their tissues are subjected to some form of irritation. I have never seen a case of cancer of the tongue in a woman. although three cases of the cancer of the jaws in the female have come under my observation.

Dr. J. J. Kyle, Indianapolis:—The essayist makes one sweeping charge that the rhino-laryngologist paid little or no attention to the mouth and scarcely excercised any skill in diagnosis. It seems to me the laryngologists are the men who do pay particular attention to the teeth, tongue, etc., and the influence of those structures upon the Eustachian tube and middle ear. We are instructing the dentists, I am sure, the way they should go in the sanitation of the mouth, and therefore I think we should take issue with the essayist under such circumstances.

Dr. E. A .Willis, Indianapolis:—The subject of lesions of the mouth interests me greatly. I appreciate the difficulty in diagnosing conditions of the upper respiratory tract because frequently I have found that an ulceration or a new growth is very hard to diagnose; in fact, impossible to diagnose without the aid of the microscope. A few years ago I had the pleasure of reporting to this Academy a resume of primary tuberculosis in the upper respiratory tract, and in that paper I recorded one case of primary tuberculosis of the tongue. Since that time I have seen a rather unusual case of tuberculoma or syphiloma of the tongue. This appeared as a growth which protruded above the surface of the tongue, and consisted of 18 or 20 elevations on the upper surface of the tongue. I removed two or three of these growths without very much questioning the history of the patient, and later two cytologists, one of Ann Arbor and the other a local man, reported on the case. One reported it as syphiloma, and the other that in all probability it was cancerous. I asked the physician to treat the case with potassium iodide and mercury, and he stated that the patient had been treated for two years with iodine in some form, and yet apparently these masses were not diminished or changed. However, he applied further treatment of the iodide and mercury, and he notified me in 6 months or more that the condition had disappeared under this treatment.

I believe Dr. Carmody mentioned only three cases of syphilis of the tongue which had been reported to his knowledge. I have investigated this subject somewhat and find that syphilis of the tongue is not so infrequent as his paper would indicate. In fact, primary tuberculosis is far more uncommon, to my mind, in the tongue than syphilis; that is, tertiary at least.

Dr. J. C. Beck, Chicago:—I would like to say that Dr. Carmody is to be congratulated for bringing this subject before the Academy because I feel colored photography has a great future in our field of work, especially in the mouth, nose and throat. The only difficulty is in presenting it, and it belittles the work, because it shows so poorly, if you use this kind of apparatus. The source of light has to be much stronger, the plates would be ruined by this light unless there is an interposition of a large quantity of water, which is being constantly changed. The intense heat spoils the plate. While in New York a few weeks ago, I investigated the process of instantaneous exposure to the colored plates, and I believe in that is the future of taking these pictures, for instance, of specimens which you cannot preserve, pathological as well as microscopical specimens in their natural color. Furthermore, you ought to see these pictures to the best advantage, by the aid of a good lantern, and this work would be appreciated.

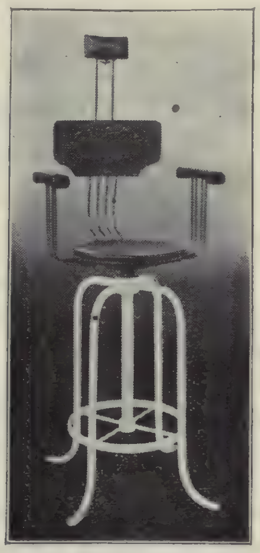
Dr. T. E. Carmody, Denver, (Closing):—Dr. Kyle takes issue with me on the fact that oto-laryngologists do not pay much attention to oral conditions. I said they had not until the last few years. However, I still maintain that they do not to any great extent. A great many oto-laryngologists cannot tell what lesion they have in the mouth. A great many times after examining the mouth they cannot tell what teeth are absent, unless it is one of the six anteriors. They do not know what the shape of the first, second, or third molar is, and for that reason we will have to study dental pathology and anatomy to a greater extent in order to be able to diagnose abnormal conditions. Dr. Dean and a number of others have written on the subject of malocclusion in its relation to nasal stenosis and these articles are interesting, but we have not paid sufficient attention to other conditions in the mouth.

I was asked about the colored photography. A great many of you know how the colors are placed upon the plates. We have three kinds of colored starch grain, the orange, the green and the violet. The light rays pass through these and, of course, the violet pass through the violet colored starch grains to the sensitized silver upon the back of the plate, the picture being taken through the plate instead of the film being placed next to the image; and, if you take a picture of violet, the light passes through the violet screen, whereas it does not pass through the orange and green. Then we use a ray filter to filter out all the other colors, so we get these only three primary colors.

Demonstration of Instruments.

A REVOLVING CHAIR, RESTING ON BALL-BEARINGS, FOR THE MAKING OF "TURNING" TESTS.

SAMUEL IGLAUER, M. D., CINCINNATI, OHIO.



The chair shown in the illustration was devised for making the "turning" movements in the testing of the vestibular apparatus. In order to facilitate the turning, the seat rests upon ball-bearings shown in Figure B, and it therefore requires but very little effort to cause the chair to revolve. The base is made of iron to insure stability and is of sufficient height to prevent the patient's feet from touching the floor. I am indebted to Max Wocher ½ Sons Co., of Cincinati, for the care they have shown in the construction of this chair for me.

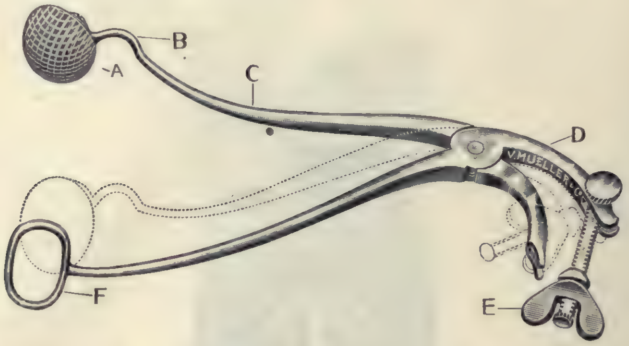
TONSIL INSTRUMENTS.

DR. RICHARD J. TIVEN, CHICAGO, ILLS.

1. *Tonsil Hemostat.*—During a tonsil operation, it frequently occurs that after one tonsil has been removed, a considerable period of delay is necessary to control the resulting hemorrhage before the operator may proceed to the removal of the remaining tonsil.

In such cases the instrument has proven efficient, controlling satisfactorily the hemorrhage, eliminating the delay incident to its control, and thereby materially shortening the period of anesthesia, time of operation and perhaps minimizing the danger of subsequent hemorrhage.

The *special* application of this hemostat is for the control of hemorrhage *during the operation.* It may be used, however, equally well for post-operative tonsillar hemorrhage.



Its application is expeditious and simple; it can be used for either tonsil without change or adjustment and being constructed entirely of metal, may be boiled without injury.

The clamping arms of the instrument are thin, light in weight and when in position the iner arm and pressure bulb adapt themselves snugly to the tonsillar fossa and anterior pillar; beyond the pillar the arm is so curved as to rest between the alveolar process and the cheeck; while the portion of arm and lock protruding from the mouth is short, curved abruptly to the outer side entirely out of the way of the operator.

The field of operation is not in the least obstructed by its use and neither the subsequent introduction and manipulation of the necessary instruments, for removal of the remaining tonsil nor the techique of the operator need be curtailed, modified or embarrassed by its presence.

In using the instrument the author has found it of advantage to cover the oval bulb with three or four layers of sterile gauze, the ends of which are first trimmed short so they will not project into the operative field, then gathered together and secured just over the base of the bulb by an ordinary rubber band, previously sterilized. This covering is moistened with a 1/1000 solution of adrenalin chorid.

A pad of gauze is also placed just behind the angle of the jaw to protect it from the slight amount of pressure exerted at this point by the external counter device of the instrument.

Explanation of the Illustration.

A.—Serrated aluminium tonsil pressure bulb, oval in form to conform to tonsillar fossa.

B.—Curve, which overrides the anterior pillar.

C.C—Arm, curved to rest, external teeth, between the alveolar process and the cheek.

D.—Portion projecting from mouth.

E.—Thumb screw and swinging arm lock for securing instrument when closed and applied.

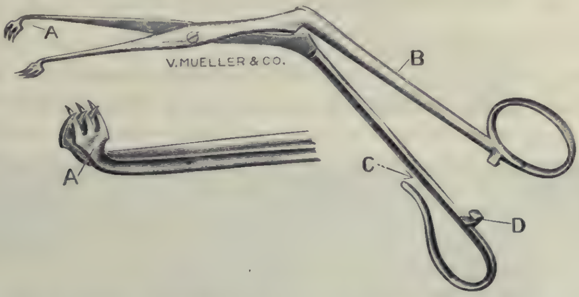
F.—The external fenestrated counter pressure plate.

The unbroken heavy lines indicate instrument when open.

The dotted lines its appearance when closed.

(2) *Tonsil Grasping forceps.*—The advan'ages of this grasping forceps are:

1st.—The instrument is thin, light in weight and delicate in construction, thus permitting facility of manipulation and clear view of the tonsil and tonsil area.



2nd—The grasping portion is placed at an angle to the rim, insuring ease of application; the teeth, three in number, are curved, spaced and edged to engage tonsil easily and securely. This arrangement is of especial advantage in dealing with the co-called sub-merged variety of tonsil.

3rd.—The handle of the instrument being nearly at right angles to the grasping portion, places the hand of the operator out of the line of vision and thus permits an unobstructed view of the field of operation at all times.

4th.—When tonsil is once engaged, the instrument is locked and the tonsil thus remains secured until removed.

5th.—The snare may be applied without releasing the tonsil by entering the loop at the opening in the finger ring, sliding it over the instrument and down to and over the tonsil.

Explanation of the Illustrations.

A.—Tonsil grasping portion, placed at angle to arm of instrument.

B.—Showing angle of handle to grasping arm.

C.—Opening in finger ring for introduction of snare.

D.—Lock.

AN IRRIGATOR.

DR. T. E. CARMODY, DENVER.

My experience with the Fowler irrigator has been so thoroughly satisfactory except for the fact that they are so frequently broken. It occured to me that a douche could be made of metal to meet the requirements and overcome this objection. It is necessary, however, to have the tube to which the fountain syringe is attached made separately so that its length may be regulated while the douche is in place on ear as you have not the advantage of view as you have in the original Fowler.

DISCUSSION OF INSTRUMENTS.

Dr. P. Fridenberg, New York City:—This chair of Dr. Iglauer's interests me very much. I think it is so good it ought to be improved upon. For clinical purposes it is very good. The subject of otitic vertigo is a very important one ,as also cerebellar vertigo, and neurasthenic vertigo. Now in that very long work of Barany he found he had variations in different classes of people, say in hystericals, and a marked difference between right and left handed people, and also people who were classified according to their previous vocation. When he examines a man he asks him if he dances, and if so, if he reverses. Now two or three things are missing here in this chair. You start out with a maximum of speed, and you come down gradually to zero. Every time you take hold of that patient you are giving a fresh start. You ought to have some sort of device on this chair so that the motion will be uniform and even. Again, you have to bring it to a stop suddenly. There may be some slight remnants of function left in the labyrinth, but by the time you stop this chair and look into the patient's eyes, the nystagmus may have gone. It may be but momentary. You ought to have a mirror in front of your chair, so that the moment he stops, you can look into his eyes. Another thing of importance is an indicator, to tell how many times you have turned. You may want to turn oftener tha ten times, 20 or 30. Vertigo and nystagmus are very complex, and we need a test that will be of some benefit.

Dr. S. Oppenheimer, New York City:—I want to suggest that Dr. Iglauer have a rest for the feet constructed on the chair.

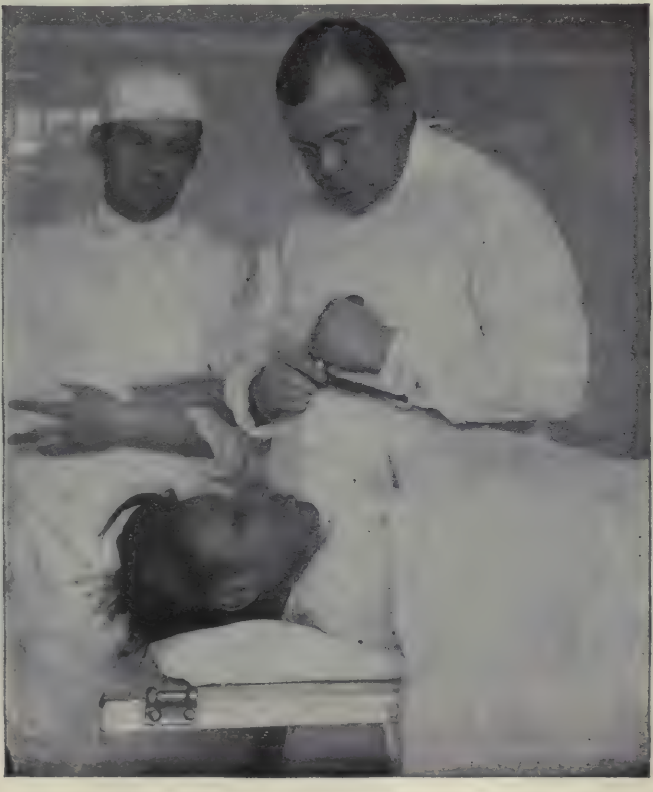
Dr. S. J. Kopetzky, New York City:—He ought to be able to change the position of the patient, to a horizontal or oblique position, and since Dr. Iglauer has taken up this chair, he might have these modifications added.

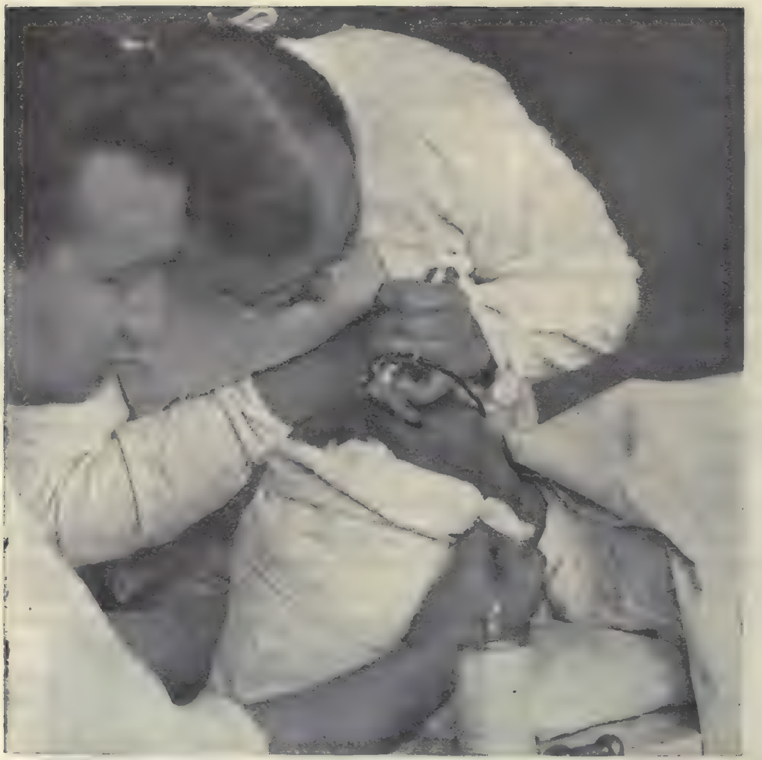
Dr. S. Iglauer, Cincinnati, (Closing):—The suggestions made are all apropos but for ordinary tests I do not think you need these many additions. If you want to see if there is any response from the labyrinth, you can get from a device of this kind. In order to make it more exact, you want to see when it begins and when it stops; you want to put a time clock so that it shows the nystagmus when it begins and when it stops. So far as ordinary clinical work is concerned, all I think you have to do is give the patient ten turns, and when the chair is well balanced by pushing it around without much more effort, it will go around.

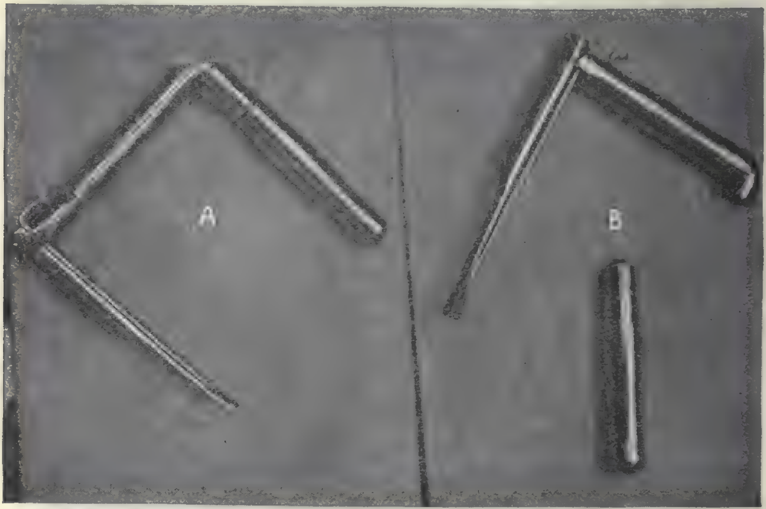
THE STRAIGHT METHOD OF LARYNGOSCOPY.

RICHARD HALL JOHNSTON, M. D., BALTIMORE.

In a paper before the American Academy of Ophthalmology and Oto-Laryngology in 1909, I advocated the flexed position of the head in direct laryngoscopy in children and in adults under general anaesthesia. Further observation has convinced me that it is not necessary to flex the head; a perfectly straight position of the body with the head held firmly by an assistant makes direct laryngoscopy simple and easy. In young children, a general anaesthetic is not necessary and, since cocaine is dangerous, it is better to examine without anaethesia.







NOTE:—*Explanation of Illustrations.* 1. Position of patient and operator in straight position. 2. Head held by assistant and speculum introduced pulling epiglottis upward. 3. (a) Modified Jackson speculum, handle attached, (b) handle detached.

The illustrations show the position of operator and patient and the method of holding the instrument better than any description. With the instrument in position, if the entire larynx is not seen, slight pressure on the thyroid cartilage by an assistant brings the anterior commissure into view. Not only can operations be performed with precision but the bronchoscope is easily passed in the straight position, after it passes between the cords, the laryngoscope is removed and the head is gently lowered over the edge of the table until the Boyce position is obtained. In young children and in adults under general anaesthesia, I pass the instrument straight down between the incisor teeth. There is practically no danger of injuring or displacing teeth if the laryngoscope is manipulated properly. In practice as one's experience increases, it will scarcely ever be necessary to resort to general anaesthesia in adults. Under local anaesthesia with the patient sitting and with the head slightly extended and turned somewhat to the right or left, the speculum is introduced between the bicuspid teeth and the tongue is pushed to the opposite side.

The spatula is then easily hooked around the epiglottis and the best view of the larynx obtained. If the anterior commissure is not seen, the head is gently brought forward in the straight position. Practically no force is required to hold the epiglottis forward and in some cases the weight of the instrument almost does this.

When one considers that not a few patients have large incisor teeth and thick tongues, the advantage of going in from the side are obvious. We gain at least ⅜inch in distance, the neck muscles are relaxed; there is no strain on the patient or the operator which is of great importance in operative work; the head is in a comfortable position and can be held so for an indefinite time.

Another advantage is the ease with which the bronchoscope can be passed. The only difficulty in connection with the position is getting into the left bronchus. If the bronchoscope is passed on the left, the head must be carried far to the right to enter the left bronchus. This can be overcome by throwing the head farther back and bringing the tube carefully over the right. These methods of examination have greatly simplified direct laryngoscopy for me .

Patients with large incisor teeth and short, thick necks are almost as easily examined and operated on as the ideal ones with long thin necks. In my work I have found no better instrument than the modified Jackson laryngoscope which is well shown in the illustration.

OBITUARY NOTICES

Abner W. Calhoun. "On Saturday, August 21, 1910, there passed away at his home in Atlanta, Georgia, after a life of unusual usefulness, our friend and confrere, Abner W. Calhoun, at the age of 65 years, during which over forty years was spent in medical work. A native of Georgia, born April 16, 1846, at Newnan, Georgia, the son of Dr. Andrew B. Calhoun, who was in his generation an eminent Southern practitioner. His mother was one of the Wellborns of Wilkes County, one of the old families of Georgia.

His primary education was gained at the public schools of Newnan, but was interrupted at the age of 15 years by the outbreak of the Civil War. Although he was the youngest member of a military company, a boy of tender years, he was nearly six feet in height and was accepted in the Confederate service, passing through four years of the war, finally coming back home for the last time after surrendering with Lee at Appomattox.

For two years after his return Calhoun continued his studies and then went into his father's office for two more years, at the age of 23 entering Jefferson Medical College at Philadelphia, taking first honor in his graduating class. Then the young doctor returned to Newnan, spending four years in general practice with his father, this proving a fine foundation for his after-career as a specialist. He then went to Vienna two years, then to Berlin for several months, and after that to London, returning home in 1873, becoming first associated with Dr. Willis Westmorland, and after branching out for himself.

He was a man of remarkable physique and found that the gruelling pace he set for himself was not usually kept up by his assistants. He became Professor of Ophthalmology and Otology at the Old Atlanta Medical College the year after he went to Atlanta, and this connection continued up to a year or so ago, the institution being one of his prides, he frequently donating to its support and having endowed a chair.

Dr. Calhoun was a member of the American Medical Association and will be long and well remembered by the members of the Section on Ophthalmology, as well as by the American Academy, the American Ophthalmological Society, and his professional associates.

He was best known as a Cataract Operator, having performed over two thousand extractions, and his chief contributions to Ophthalmology were along those lines.

He was a Southern gentleman, the first and, in many respects, the greatest specialist of the Southern States. His five and sixty useful, brilliant years brought not alone light to the eyes of men,

but to their souls as well. He gave of his knowledge and genius to the poorest as bountifully as to the richest. He was a success, both professionally and financially, accumulating a fortune from investments and from his profession, dying in the traces when he was just about ready to retire and spend the declining years of his life surrounded by all the joys and comforts a man could wish."
(From Ophthalmology, Jan. 1911.)

Clarence Wright Heath, M. D. College of Physicians and Surgeons, Chicago, 1900; a member of the American Medical Association; oculist to the Erring Woman's Refuge of Reform and St. Joseph's Hospital; instructor in ophthalmology in the Chicago Policlinic; died in Mercy Hospital, Benton Harbor, Mich., January 16, from pneumonia, aged 40. (Jour. A. M. A.)

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